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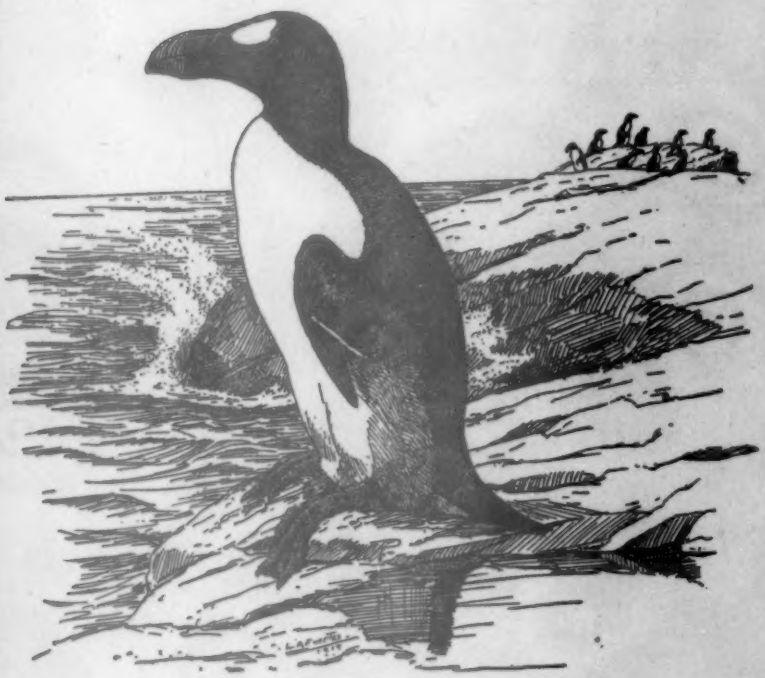

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(*Upper figure*), COASTAL HILLS OF PRE-CAMBRIAN ROCK AT LAKE HARBOUR, BAFFIN ISLAND, JULY, 1931. ALL HIGHER ELEVATIONS ARE REFERABLE TO THE *Desert Tundra* (*c*). MODIFIED *Grass Tundra* (*b*) CONDITIONS PREVAIL IN MANY OF THE MOIST, SHELTERED VALLEYS.

(*Lower figure*), HEAVY GROWTH OF WILLOWS ALONG A BROOK TRIBUTARY TO SOPER RIVER IN LATITUDE 63° 08′ 53″ N., NORTH OF LAKE HARBOUR, BAFFIN ISLAND. ECOLOGICAL CONDITIONS REPRESENTATIVE OF THE POLAR *Transition Zone* (*a*). EARLY JULY, 1931.

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ORNITHOLOGICAL RESULTS OF THE BAFFIN ISLAND EXPEDITIONS OF 1928–1929 AND 1930–1931, TOGETHER WITH MORE RECENT RECORDS[1]

BY J. DEWEY SOPER

Plates 1, 2

INTRODUCTION

THE chief object of the present paper is to record the writer's bird observations of the two southern Baffin Island expeditions which were carried out for the Dominion Government from 1928 to 1931. These were closely interrelated in the broader objectives; they also constituted a logical continuation of the work commenced on two former expeditions undertaken for the National Museum of Canada. The first of the latter projects covered the eastern Canadian Arctic, in general, during the cruise of the C. G. S. *Arctic* in 1923, while the second was devoted to widespread investigations in south-central and southwestern Baffin Island from 1924 to 1926. The results of these first two expeditions, together with many notes by earlier naturalists, were published in 'A Faunal Investigation of Southern Baffin Island,' 1928. To secure a complete picture of the avifaunal resources of the territory in question, this publication should be read in conjunction with the present report. In addition, there are many valuable papers listed in the bibliography which deal with various phases of the subject.

The bird investigations of 1928 to 1931, recorded in the present paper, were designed as much as possible to cover territory not explored on the two earlier expeditions. In actual field work the plan was notably successful, although a slight overlapping necessarily occurred in the Cape Dorset locality. However, as most of the work was conducted here earlier and later in the season than during the

[1] Published with the permission of the Northwest Territories Administration, Ottawa, Canada.

summer of 1926, there is scarcely any similarity in the results. By far the greater part of the investigations was carried out in more remote areas. Most of the region at that time had not been previously visited by any naturalist, and, incidentally, it still holds true that as yet the author is the only one to have primarily pursued wild-life inquiries over certain extensive coastal and interior areas of southern Baffin Island.

On his third Arctic expedition, the writer proceeded to southwestern Baffin Island aboard the S. S. *Nascopie,* arriving at Cape Dorset in late July, 1928. Headquarters were established in the Hudson's Bay Company post at that place for the following year. Long journeys were immediately undertaken with Eskimo assistants along the coast to the east and west and into the interior. During August, a trip was made to Cape Dorchester. In September, the party travelled to Andrew Gordon Bay, thence north through a chain of lakes to Ungmaluktuk Lake in latitude 65° N.; return to Cape Dorset was made on October 1. As winter was now setting in, serious travel was impossible for many following weeks and investigations were consequently confined to the Cape Dorset locality.

In January, 1929, an overland traverse of Foxe Peninsula was run from Andrew Gordon Bay to Nuwata, thence eastward to Ungmaluktuk, Shidawatalik, and Tessikjuak lakes, with a return to Cape Dorset via Andrew Gordon Bay. This was followed by extensive detail work in the Cape Dorset sector. The party then left on the longest journey of the expedition; a third crossing of the Foxe Peninsula interior was made from Andrew Gordon Bay to Bowman Bay, thence the west coast was explored to the mouth of Hantzsch River in latitude 67° 33′ 30″ N., and the latter ascended for 39 miles from the sea. A return was then made to Foxe Basin over a new route across the tundra; this part of the coast was then retraced to Bowman Bay to recover supplies at previously established depots en route. Following a reconnaissance survey to Putnam Highland as a side-trip, the fourth traverse of Foxe Peninsula was run from Bowman Bay to Andrew Gordon Bay, via a route west of Tessikjuak Lake. This entailed a non-stop journey of 35 days, from March 11 to April 14, over a distance of 820 miles.

The fifth and last major undertaking involved a journey east from Cape Dorset to Chorkbak Inlet, from which the fifth track survey of Foxe Peninsula was carried northeast across the interior to Bowman Bay and north. A summer camp (Camp Kunkovik) was established on Blue Goose River in latitude 65° 35′ 18″ N., which was

occupied from May 24 to July 20. It was during this period that a study of the Blue Goose was made and zoological activities in general carried out on a comparatively large scale. Return was made by canoe down Blue Goose River to Bowman Bay and along the south coast of Foxe Basin to the mouth of Kommanik River. This river was then ascended and the journey continued via the lake chain over the height of land to Andrew Gordon Bay, and thence to Dorset. The party was absent from headquarters for three months, beginning May 17, 1929 (Soper, 1930d). Work was then carried out in late August from Cape Dorset to Lake Harbour. The writer returned to civilization on the S. S. *Beothic*.

Again under instructions from the Department of the Interior, Ottawa, the writer sailed for Lake Harbour in July, 1930, aboard the S. S. *Nascopie* from Montreal, and took up residence there for a year. Sufficient materials were taken north a few weeks later on the S. S. *Beothic* to build a research station as headquarters. During the year in the region, the same plans for investigations were followed as on the former expedition, in which biological and other work was combined with surveys of coasts and interior.

Minute attention was given to the main coast from Crooks Inlet southeastward to Ayde Point, near Icy Cove, with somewhat extended investigations locally into the interior from several feasible points. Much detailed work was carried out in the general neighborhood of Lake Harbour and west through White Strait. The major undertaking of 1931, aside from the investigations on the outer coastline east and west of North Bay, was the exploration and survey of Soper River, north through the mountains to Mount Joy and beyond, to latitude 63° 16′ N. (Soper, 1936). Taking the Hudson's Bay Company's S. S. *Ungava* from Lake Harbour, the return was made to Ottawa via Port Churchill, Hudson Bay, during the early part of August, 1931.

The region covered by these investigations embraces a direct coastline distance of nearly 800 miles, as well as large bordering and extraterritorial areas of the interior. In pursuit of the desired information the writer made journeys by freighter canoe and dog sledge over a total travelled distance of some 4,500 miles, bringing under more or less direct observation an area of not less than 10,000 square miles. From a geographic angle, uniting direct observation with correlation of widespread route survey data, the area retrieved from the unknown may be said to represent a tract of no less than 20,000 square miles. It was in this newly explored territory in

southern and western Baffin Island that the avifaunal information of the present report was secured.

It is with deep personal pleasure that acknowledgement is here made of the numerous courtesies received during the course of the Baffin Island investigations through the unvarying kindness and coöperation of the Royal Canadian Mounted Police and Hudson's Bay Company officers. It is also with lasting gratitude that the many faithful Eskimo assistants of the expeditions are remembered, without whose loyal help the more ambitious plans could not have succeeded. At home, much appreciated coöperation was received from Dr. R. M. Anderson and Dr. A. L. Rand, National Museum of Canada, Ottawa, and especially Mr. P. A. Taverner who was formerly in charge of the ornithological section of that institution. Finally, acknowledgements are due to Mr. E. F. G. White, officers of the Royal Ontario Museum of Zoology and Mr. T. H. Manning, for kindly placing at my disposal Baffin Island records of birds acquired at various times after the close of the 1931 expedition. Since then most of these have been published.

The writer's total contribution to a knowledge of Baffin Island's higher vertebrates, so far as collected material is concerned, embraces a total of about 1,850 specimens taken from 1923 to 1931. Those preserved from 1923 to 1926, inclusive, were collected directly for the National Museum of Canada, while those taken from 1928 to 1931 were presented to that museum by the former Northwest Territories and Yukon Branch, Department of the Interior, Ottawa.

In nomenclature and sequence of species, the bird list follows the Fourth Edition of the American Ornithologists' Union Check-List, 1931, and the Nineteenth and Twentieth Supplements thereto. Descriptive colors are based on Ridgway's 'Color Standards and Color Nomenclature,' 1912. Measurements are in inches. The following account includes only those birds which were observed during the expeditions from 1928 to 1931, together with a few others that have been added to the southern Baffin Island list since that time. By following this course, the present report and that of 1928 conveniently include all species and subspecies recorded in the territory under consideration. A number of species are preceded by an asterisk; this is designed to draw the reader's attention to the fact that more lengthy treatment of these is to be found in the author's much earlier preliminary paper entitled, 'Interesting Bird Records for Southern Baffin Island,' 1934.

OTHER ORNITHOLOGICAL INVESTIGATORS

It is not proposed here to enter into a long discussion of southern Baffin Island explorations. A splendid, detailed account of this is given by Millward (1930), particularly for that period from 1874 until 1928, and should be consulted by all those interested in this historic background. Anything like lengthy investigations by qualified naturalists have been few.

The earliest faunal investigator in Baffin Island was Ludwig Kumlien of the Smithsonian Institution, Washington, D. C. As most of his observations in 1877–1878 were made in Cumberland Sound, and outside of the territory strictly dealt with here, casual mention is all that is necessary in this place (see Kumlien, 1879, and Taylor, 1937). Next in order was Bernhard A. Hantzsch, a German naturalist of Dresden, Saxony. From 1909 to 1911 he observed and collected from Blacklead Island, Cumberland Sound, west to Nettilling Lake and Foxe Basin. In the spring of the latter year he died and was buried by Eskimos about 12 miles north of the river that now bears his name (Hantzsch, Hesse and Rosenmuller, 1913–1915, and Anderson, 1928). Part of Hantzsch's work was done in territory involved in the present paper.

The Donald B. MacMillan Expedition, of 1921–1922, wintered in the motor-ship *Bowdoin* at Schooner Harbour (longitude 77° 52′ W., latitude 64° 24′ N.), west coast of Foxe Peninsula. Observations were made on the birds of the general vicinity during the winter and spring. In the year 1926, MacMillan again briefly visited southern Baffin Island in command of the Rawson-MacMillan Subarctic Expedition, Field Museum, Chicago. The following summer the *Bowdoin*, under temporary command of J. T. Crowell, Jr., circumnavigated Frobisher Bay, where the party made investigations in several branches of natural science, including zoology.

The Putnam Baffin Island Expedition in 1927 surveyed the north coast of Foxe Peninsula east to Bowman Bay and north to latitude 66° 17′ N. The expedition was chiefly concerned with geography, but a few references are made to birds in a geographic article published the next year (Putnam, 1928). In the summer of 1937, the Donald B. MacMillan Arctic Expedition again visited Frobisher Bay, Baffin Island, and engaged in faunal investigations. Apparently the only published result as yet is Forbes' (1938) paper on the Greenland Wheatear.

Dr. R. M. Anderson, National Museum of Canada, visited several points on Baffin Island during the Canadian Arctic Expedition

of 1928, adding to our knowledge of the wild life. The following summer, P. A. Taverner (1930), of the same institution, made a similar trip aboard the S. S. *Beothic* on the Dominion Government's annual expedition into the Arctic regions, during which many specimens of birds were secured. On government voyages of the same character some ornithological work was carried out in 1938 by T. M. Shortt, Royal Ontario Museum of Zoology, Toronto, and by H. S. Peters, in 1939, for the United States Fish and Wildlife Service, Washington; their results were jointly published in 1942.

After spending three years in and about Southampton Island, T. H. Manning (1942) of the British-Canadian Arctic Expedition crossed over to Baffin Island in 1938, where he worked until 1940. His most important faunal investigations on this island were conducted in northern Foxe Peninsula and north along the west coast, particularly at Taverner Bay. In association with him, at times, was Reynold Bray who was drowned in September, 1938 (McAtee, 1940). Results of his work were later published by Manning (Bray, 1943).

PHYSICAL CHARACTERISTICS

Much the greater part of the territory under review is either hilly or mountainous. However, surface conditions vary enormously from place to place; in general, the terrain is high and rugged in the east and south and gradually decreases in altitude to meet the great grass tundra along the west coast. Most of the country has a bleak and barren appearance characteristic of polar lands.

Three principal mountain ranges occupy the southeastern part of Baffin Island. All trend in a northwesterly direction nearly parallel with the northeastern coast of the island. The outer or northernmost range in Cumberland Peninsula is the highest, and the one along Hudson Strait the lowest. In the former, the mountains rise from about 5,000 to 8,000 feet, in that between Cumberland Sound and Frobisher Bay, 2,500 to probably 4,000 feet, and in the one bordering on Hudson Strait, from about 1,000 to 3,000 feet. This southernmost range rapidly decreases in height to the westward until at Cape Dorset and King Charles Cape it is no more than 800 to 1,000 feet in its highest parts (Soper, 1930b).

The land in the Lake Harbour district (Soper, 1936), including the coastal fringe of islands to the east and west, varies in height from 50 to 600 or 700 feet. Ten to 12 miles north of the harbor the well-marked southern wall of the interior highlands rises roughly parallel to the coast, with elevations of 1,200 to 1,500 feet; north-

ward there is a gradual increase in height to the top of the divide (at about 3,000 feet), which lies closest to Frobisher Bay. On the northern watershed of this peninsula the Grinnell Glacier apparently occupies an area of about 1,600 square miles. The mountains inland to the northeast of Markham Bay and southeast of Amadjuak Lake are probably the highest in the whole sector bordering upon Hudson Strait. Through the effects of weathering, most of the terrain is very rough, with numerous talus slides on the valley slopes.

Foxe Peninsula is characterized by far-reaching lowlands north of the big hill belt along Hudson Strait. These are interspersed with innumerable low ridges and several well-defined ranges of Laurentian rock with a northwest-southeast trend. Small lakes are plentiful, of which the largest known in the peninsula is Tessikjuak, with a length of 17 miles. The low, rolling terrain of northern Foxe Peninsula merges into the western grass tundra east and north of Bowman Bay. This plain extends from Putnam Highland along the Foxe Basin coast north beyond Koukdjuak River to latitude 67° 15′ N., and east to Nettilling Lake, with an area of about 5,500 square miles. Two conspicuous and isolated table-top plateaus of Ordovician limestone in part flank the grass tundra on the east—Soper Highland northwest of Nettilling Lake, averaging about 200 feet in height, and Putnam Highland northwest of Amadjuak Lake rising to 600 or 700 feet. Streams of varying size occur in large numbers, though many flow only during the spring run-off. The two largest known streams in the southern territory are Koukdjuak River, which drains Nettilling Lake, and Soper River that discharges into Hudson Strait near Lake Harbour.

One of the notable physical features of the south coast is the profusion of rocky islands that front it, particularly in its central section. In some areas they are very thickly clustered, forming a bewildering maze. This archipelago is most pronounced between Fair Ness and Chorkbak Inlet, where it extends from the coast to varying distances of 10 to 25 miles; it attains its maximum width in the neighborhood of Amadjuak Bay. Beyond Chorkbak Inlet the islands are much less numerous, as is also the case between North Bay and the Middle Savage Islands and eastwardly to Gabriel Strait.

CLIMATIC CONDITIONS

The climate of the region is essentially similar throughout. From place to place, however, there are generally some differences in the amount and direction of winds and in temperatures, snowfall, fog, and other phenomena. As these vary markedly from year to year in the

same place, the scantiness of data for the area renders definite comparisons impossible. On the whole, the climate seems to be somewhat milder in southeastern Baffin Island than in the western parts, and is naturally so in comparison with substantially higher latitudes. Winds are definitely less violent at Lake Harbour than at Cape Dorset or about Cumberland Sound.

Climatic conditions throughout are unconditionally Arctic; though the lower part of the region lies at the southeastern extremity of the Canadian Arctic Archipelago, it is still nearly 400 miles north of the climatic limit of the polar zones. For this boundary the mean isotherm of 50 degrees (Fahr.) for the warmest month of the year is usually adopted, which closely coincides with the tree limit of circumpolar lands.

The length of the southern Baffin Island winter fluctuates from year to year, but it may be said to last from late September until late May. Arrival of the first permanent snowfall of the season varies from about September 20 to early October. Slob ice begins to form in the bays and inlets late in September, but usually it is not very pronounced until the early half of October. Bay ice is normally safe for travel in late November. The small lakes and ponds freeze over in early October, if not sooner. Ice continues to increase in depth until about the last of April, as modified winter conditions prevail until about that time.

The first evidences of spring usually appear in early May. On occasional days the sun feels warm again in sheltered nooks, with a slight softening of the snow, and rocks are slowly exposed on the ridges. Once fairly under way, spring advances with the magical rapidity characteristic of the polar lands. By the middle of May there are great changes. Extensive areas of higher elevations and slopes are bare and brown, and during the third or last week of the month, the purple saxifrages begin to burst into bloom.

In southern Baffin Island the country is practically snow free by the middle of June. However, belated snowbanks commonly persist on shadowed northern slopes and on the high mountains until August. By late June the smaller lakes are again open, but the larger ones are progressively later according to size. Bodies such as Amadjuak and Nettilling lakes remain frozen over until late July or early August. The Arctic spring, although amazingly rapid in its action, is still laggard in many respects, fickle and fluctuating as to temperature, and with snow flurries some years until the middle of June. This month is essentially spring-like.

Summer may be regarded as commencing about the first of July. Insect life is aroused to great activity, flies and mosquitoes become annoying and bumblebees and various butterflies add a typical summer touch to the sheltered valleys. This season occupies about six or seven weeks of the year. By late August the nights become much cooler again, introducing numerous suggestions of early autumn. Another week and night-time freezing temperatures occur, with the crisp tang of fall days. Most of September is characteristically autumn, but with its later days, winter is once more reinstated, or close at hand.

The extreme range of temperature for the region is approximately 130 degrees; that is, from about 75 degrees above to 60 or 70 degrees below zero. July is the warmest month of the year, with a mean temperature of about 45 degrees. February is usually the coldest, with a monthly mean of about 20 degrees below zero, but sometimes this distinction falls to either January or March. The southwestern part of the island has a consistently colder climate (Soper, 1930d: 33–37) and a somewhat longer winter than the Lake Harbour region. Winter temperatures along the south and east coasts would be considerably lower were it not for the influence of much open sea all winter in Hudson and Davis straits. In closing, it may be broadly stated that degrees of frost steadily increase until late February or early March, when with the rapidly mounting sun the cold gradually diminishes until a maximum temperature of relative stability and uniformity is attained during July and early August.

THE ARCTIC LIFE ZONE

Baffin Island lies entirely within the Arctic Zone or Tundra Biome. Technically, the Arctic Circle (66° 33′ 03″ N.) becomes the southern edge of this division in the way it defines certain natural phenomena; it is, for example, the practical southern limit of day without night during the summer solstice and night without day at the winter solstice; all north of this line during midsummer is the "Land of the midnight sun." Owing, however, to the effects of cold, southward-setting ocean currents, of winds, slope, and temperature, the zoögeographic southern limit of the Arctic Zone is in many places far south of the Arctic Circle. Of the five areas into which this zone is divided, we are concerned here only with the Barren-ground Subfauna, which, including vast areas of the northern Canadian mainland and adjacent polar islands, totally embraces Baffin Island.

Because of certain well-recognized factors, a pronounced local dispersion of land fauna exists in Baffin Island which is well worthy

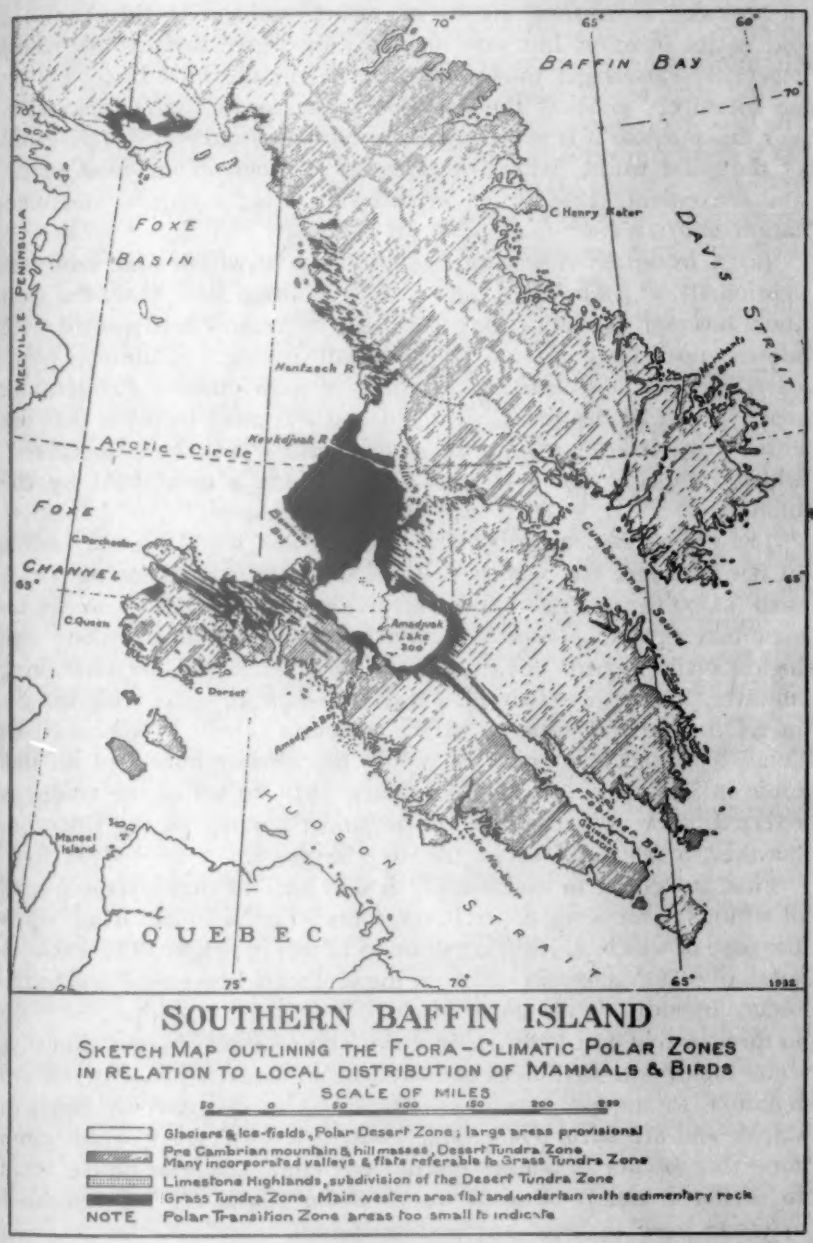
SOUTHERN BAFFIN ISLAND

SCALE OF MILES

SKETCH MAP SHOWING LOCATION OF AUTHOR'S CAMPS FOR OBSERVATION AND COLLECTION OF SPECIMENS DURING VARIOUS EXPEDITIONS FROM 1923 TO 1931

Camps •

TEXT-FIGURE 1



SOUTHERN BAFFIN ISLAND

SKETCH MAP OUTLINING THE FLORA-CLIMATIC POLAR ZONES IN RELATION TO LOCAL DISTRIBUTION OF MAMMALS & BIRDS

SCALE OF MILES
50 0 50 100 150 200 250

Glaciers & ice-fields, Polar Desert Zone; large areas provisional
Pre Cambrian mountain & hill masses, Desert Tundra Zone. Many incorporated valleys & flats referable to Grass Tundra Zone
Limestone Highlands, subdivision of the Desert Tundra Zone
Grass Tundra Zone. Main western area flat and underlain with sedimentary rock
NOTE Polar Transition Zone areas too small to indicate

TEXT-FIGURE 2

of remark. Conditions are by no means uniform in the Arctic as one might imagine, but vary markedly in degree and extent. This especially encourages uneven distribution in the bird life. To get an intelligent grasp of the situation some classification is necessary. For this purpose it is proposed to use Nordenskjold's (1928) divisions of the polar world (which he refers to as zones) as the most useful and convenient; these express relationship between climate and vegetation and are four in number, as follows:

(a) A *transition zone* with small thickets of willow and, more exceptionally, of dwarf birch, alder, and mountain ash. Only the next zone, however, is truly polar; (b) the *grass tundra* interspersed with mosses and lichens and, on the whole, still having a continuous plant cover; (c) the *desert tundra* consisting of individuals of cushion and mat types of higher plants scattered and separated by areas that are either bare or overgrown with scanty lichens; (d) the *polar desert*, which comprises the vast areas of polar lands dominated by the inland ice.

These floral-climatic divisions of the polar world, as they occur in Baffin Island, are broadly delineated on the accompanying sketch map (Text-figure 2) as known at present. The territory under review may rightly be regarded as having representations of these ecological divisions from one extreme to the other. The two outer ones, however, are quite restricted. Owing to lack of space, this subject in relation to the dispersal of the avifauna cannot be discussed in detail here and, moreover, the writer has already published on this topic in The Auk, 57: 13–21, January, 1940, to which the reader is referred. For an immediate, broad understanding of the situation, however, a few brief comments may be made.

First, in respect to division (a), it may be said that several species of willows occur along Soper River, some 30 miles inland from North Bay, one of which, at least, grows up to 12 feet in height The Eskimos speak of other mountain valleys to the southeast where similar growths occur. In addition, the dwarf birch (*Betula nana*) develops bushes up to three or four feet high. It is obvious on grounds of vegetation that some highly localized areas of extreme southeastern Baffin Island are referable to the *polar transition zone* (a) as classified by Nordenskjold, and are fairly comparable (but in lesser degree) to this same zone that occurs in southwestern Greenland. Representative areas in sheltered valleys of southeastern Baffin Island are too restricted as yet to have attracted any peculiar fauna.

Most of the region, however, is to be placed in the first true polar zone (b), the *grass tundra*, with its prostrate shrubs, grasses, flow-

ering phanerogams, and, as well, a fairly continuous cover of mosses and lichens on open plains and favorable valley floors and sheltered slopes. A vast area of flat tundra lands in northern Foxe Peninsula and northward along the west coast of Baffin Island falls within this zone; also isolated tracts of rocky lowland along the coasts and in sheltered valleys all over the land. This is the great, intermediate zone of Baffin Island wild life, which harbors the majority of terrestrial species. Parts of this territory fairly teem with birds of numerous species and are by all odds the most attractive to the naturalist. Swampy portions are particularly rich in nesting waders and the section along the western coast north of Bowman Bay is also notable for its breeding Blue and Lesser Snow Geese.

The next two divisions, from a naturalist's viewpoint, are of minor interest. The *desert tundra* (c) is represented in Baffin Island by areas as great as, if not greater in extent than, that of the preceding zone. The present one is fixed on the elevated areas of Laurentian granites, etc., the cold mountain plateaus, and the table-tops of Putnam and Soper highlands. It also occupies large tracts of high and intermediate mountain slopes, and frequently the tops of hills and ridges only a few hundred feet high; the condition even creeps lower in many places where peculiarly rigorous, climatic conditions prevail. This zone is poor in bird life, but not devoid of it. The commoner species are Snow Bunting, American Pipit, Horned Lark and Rock Ptarmigan, but all of these are much more abundant on the *grass tundra*. On the whole, the *desert tundra*, especially in its more austere limits, will be found comparatively lifeless.

The *polar desert* (d) calls up visions of perpetual ice and snow. The Grinnell Glacier with an area of probably 1,600 square miles of ice is representative of this subdivision; it occurs on the north side of Grinnell Peninsula and discharges into Frobisher Bay—the only active glacier in southern Baffin Island. Farther north, in the magnificent 5,000 to 8,000-foot mountains of the Cumberland Highlands and northwestwards, large ice-fields of unknown extent occur in hanging valleys and on high plateaus. In the region under review the two zonal extreme occur by chance almost side by side; that is, as seen in the Grinnell Glacier on the north slope of the peninsula, and in the small, scattered areas of high willow shrubs in the Hudson Strait valleys south of the height of land. In winter the *polar desert zone* is absolutely lifeless, for no food exists; in summer, waves of migrating birds drift over the white fields in migration, or a few ubiquitous Snow Buntings curiously explore the scanty morainal debris of the ice wastes in search of spiders. Even in summer, however, it is practically lifeless.

ANNOTATED LIST OF BIRDS

1. **Gavia immer immer** (Brünnich), COMMON LOON. Eskimo: *Tūd"lik'*.—Very scarce throughout the entire length of the south and west coasts of Foxe Peninsula, though it is occasionally observed in various localities. During the voyage from Cape Dorset to Cape Dorchester and return in August 1928, not one was positively identified. It is there supplanted by the Red-throated Loon. On the September trip to the interior north of Andrew Gordon Bay, on the other hand, it was found common (and to the exclusion of *stellata*) on all fresh waters north to Tessikjuak and Ungmaluktuk Lakes.

The species is rare in the Bowman Bay sector. Only one was observed there (July 1) during the spring and summer, and none thereafter until the party reached Tessikjuak Lake in mid-August. The Pacific Loon, conversely, is common and the Red-throated Loon is scarce. These facts make it plainly evident that the different species of loons may, on occasion, have well-defined and locally separated breeding ranges. They are also known to overlap, however, for two species may be tolerably common in the same district, as *immer* and *pacifica* at Nettilling Lake.

Immer is relatively common in the Lake Harbour region, where it was noted on numerous occasions during August, 1930, especially about White Strait. The Eskimos report it in fair numbers on the numerous small lakes of Grinnell Peninsula, where it breeds regularly; its nests are said never to be numerous. It seems to be a well-established fact that this loon has a more distinct tendency—at least during the breeding season—to resort to freshwater lakes than to the sea. When the small lakes freeze over in early October it is forced to the larger lakes, or to salt water along the coast, where individuals are known to linger until at least the middle of the month.

The species usually arrives in Baffin Island during the first week of June. At Lake Harbour, in 1931, the first individual was noted on June 7, followed by numerous others migrating northwards during the next ten days. At this time the lakes, and all the bays and inlets along the coast, are still frozen over. In July, scattered examples were noted along Soper River, far into the interior, and in ponds along the coast southeast to Philpot Bay.

2. **Gavia arctica pacifica** (Lawrence), PACIFIC LOON. Eskimo: *Kūdlu"lik'*.—Like the Common Loon, this species is comparatively rare along the coasts of Foxe Peninsula. It is so uncommon, in fact, that not a single individual was positively recorded by the writer, in 1928, along the south and west coasts, nor in the interior north of Andrew Gordon Bay to the Foxe Basin watershed. Many of the Eskimos of the peninsula are unfamiliar with it, and Mr. Henry Voisey, after two years at Cape Dorset, did not know it.

In the spring of 1929 it was first noted at Camp Kungovik on June 11. It steadily increased in numbers until June 23, thereafter becoming one of the most characteristic birds of the tundra. On July 5, a set of two fresh eggs was collected on marshy ground at the margin of Blue Goose River. The nest consisted of a simple, shallow depression in the wet soil of the tundra, sparingly lined with grasses. The species was found almost as common along the south coast of Foxe Basin, especially in the region of Bowman Bay, and at Cape Alberta, where it was a familiar occupant of the small ponds and lakes, Its lonely wail was almost constantly heard floating with dismal insistence on the varying winds of the tundra—the most melancholy voice of the Arctic lands. During early August it was almost hourly seen, or heard, all along the low, southern coast of Foxe Basin. Upon ascending Kommanik River, the species became increasingly scarcer to the south, and finally almost disappeared on the Hudson Strait watershed.

The Pacific Loon is not as common as the preceding species in the Lake Harbour region. It was noted on a few occasions, at wide intervals, during the summer and fall of 1930, and again sparingly in the spring and summer of 1931. The Eskimos report these birds from various localities along the coast, and state that they nest both in the vicinity of the sea and about freshwater lakes in the interior. Apparently the species is nowhere very common in the region.

Two specimens of this loon were taken in the Lake Harbour district by Rev. C. L. W. Bailey and forwarded to the Royal Ontario Museum of Zoology. He secured one at the end of May near the settlement, and the other on June 17, 1930, at Saddleback Islands. The following day at an island off Big Island he collected an egg of the species from a nest located in a colony of eider ducks.

3. **Gavia stellata** (Pontoppidan), RED-THROATED LOON. Eskimo: *Kŏk'sāu.*—The Red-throated Loon is by far the commonest diver in the coastal areas of southwestern Foxe Peninsula. In August, 1928, it was observed in large numbers between Capes Dorset and Dorchester, where it breeds freely; the population, however, is concentrated to the northward of Cape Queen. It is particularly abundant in the vicinity of Nuwata and Cape Weston, where the coastal swamp lands with their plethora of small ponds and lakes are eminently suited to its requirements. On August 24, two adults were collected at Storm Cove, Cape Weston, as well as a downy young 13 inches in length. Southeast of Trinity Islands it is markedly scarcer, but persists with more or less frequency to Cape Dorset and eastwardly along Hudson Strait.

In the Bowman Bay region the Red-throated Loon is not uncommon, but much less numerous than the preceding species. It put in its first appearance at Camp Kungovik on June 22, 1929—eleven days later than *pacifica*—after which it was observed almost daily. Fair numbers were seen along the south coast of Foxe Basin to Kommanik River, but rapidly decreased southwards in the central interior north of Hudson Strait.

Along the southeastern coast of Baffin Island, *stellata* is a regular breeder. It was several times observed by the writer during August and September, 1930, about Lake Harbour and west to White Strait. In 1931 it made its first appearance on June 6. The following day, several individuals were noted in McKellar Bay, and a male and female collected. At this time they were frequenting the open sea along the floe-edge, tidal cracks in the ice near shore, and small, open ponds on the land. Although apparently almost indifferent to topographical conditions, it appears to favor lowlands with swampy lake surroundings for bringing forth its young. The most rugged and mountainous districts of eastern Baffin Island, however, also attract large numbers during the breeding season.

4. **Podilymbus podiceps** (Linnaeus), PIED-BILLED GREBE.—During the first week of November, 1932, one of these birds was taken at Fair Ness, Markham Bay, and forwarded by the Rev. C. L. W. Bailey to the Royal Ontario Museum of Zoology, Toronto (Snyder, 1935). This is a most unusual incident and constitutes the first and only record of the species in Baffin Island.

5. **Fulmarus glacialis glacialis** (Linnaeus), ATLANTIC FULMAR. Eskimo: *Kŏk''ŏdlūk'.*—Not observed by the writer anywhere in the region from 1928 to 1931. Its rarity is, therefore, well established; that it occasionally occurs, however, is evident from the reports of the Eskimos at both Cape Dorset and Lake Harbour. They report that it is occasionally met with well off the coast in Hudson Strait.

It is not known to breed anywhere in the latter region, but it does so in several colonies along the east coast of Baffin Island.

6. **Phalacrocorax auritus** (Lesson), DOUBLE-CRESTED CORMORANT.—Through the courtesy of the Hudson's Bay Company, a cormorant skin was secured from an Eskimo in Frobisher Bay in February, 1931. This turned out to be not *carbo* as listed by Kumlien (1879: 94), but the present form, and supplies the first record for it in Baffin Island. The native who shot the bird said that it was taken the previous summer between Ward Inlet and Mingooktok, while it was drinking at the margin of a small sea-coast lake. The report was received that this was the first cormorant that the Eskimos, or others, had ever seen in that part of the country.

7. **Cygnus columbianus** (Ord), WHISTLING SWAN. Eskimo: *Kŭŏd"jŭk'*.—The Whistling Swan is occasionally observed migrating over Cape Dorset about the middle of June. The Eskimos report the species from time to time during the spring migration, in particular, and more frequently in the western part of the island than to the east. It is not known to breed anywhere along the south coast.

While encamped at the Eskimo settlement of Nuwata, on August 27, 1928, a native hunter presented me with four nearly full-grown but flightless immatures. More particularly are these of interest in view of the fact that they represent the first authentic evidence of the breeding of the Whistling Swan on the island. The Eskimos state that a few of these birds nest each year in this territory, but that on the whole the species is very scarce in Foxe Peninsula. A pair of adults with two large young of the season were encountered on Kommanik River, August 13, 1929, about five miles from Foxe Basin. These were the only swans observed during the summer.

The Lake Harbour Eskimos are more or less familiar with this bird, and state that it has occasionally been seen in the district. A summary of reports indicates, conclusively, that it is extremely rare in the east. Nothing was seen of the species in 1930–1931. The main migration is far to the west.

8. **Branta canadensis canadensis** (Linnaeus), COMMON CANADA GOOSE. Eskimo: *Nĕd"lĭk'*.—Breeds very sparingly along the southern coast of Foxe Peninsula. In the southwest this race appears to be confined to the immediate vicinity of Hudson Strait, with more liberal numbers and evidently average larger size eastwardly from at least Amadjuak Bay to Gabriel Strait. Along the Baffin Island coasts of Foxe Channel and Basin, it appears to be totally absent as a breeder; in the Cape Dorset district it is associated to a limited extent with breeding *B. c. hutchinsi*. None was taken or observed during the expedition of 1928–1929 to the southwestern part of the island, though specimens and eggs were taken there in 1926.

Nothing was seen of it at Lake Harbour during the late summer and the fall of 1930. The Eskimos, however, reported that the *Nedlik* nested at many places along the coast and inland on meadowlands bordering the larger streams. The first migrating Canada Geese were noted the following spring on May 20. A week from that date the birds, in small migrating flocks, became much more numerous. They were now frequently seen feeding on the lowland margins of lakes among the hills and the Eskimos reported them almost daily from outlying localities. Small flocks continued to pass over until the first week of June. The last flock, composed of about forty individuals, was observed flying northward on June 7.

During this period the writer collected several specimens of the present form. These impressed him as being somewhat larger and heavier, on an average, than any

(*Upper figure*), SWAMPY LOWLANDS ALONG THE FOXE BASIN COAST AT BOWMAN BAY, WESTERN BAFFIN ISLAND. EXAMPLE OF THE *Grass Tundra* (*b*). PARASITIC JAEGER IN THE MIDDLE DISTANCE. LATE JUNE, 1929.

(*Lower figure*), MOUNTAINS AT PANGNIRTUNG PASS, CUMBERLAND PENINSULA, BAFFIN ISLAND, RANGING UP TO ABOUT 5000 FEET ABOVE SEA-LEVEL; TYPICAL OF MANY SECTORS ALONG THE EASTERN SEABOARD. FOREGROUND, AT ABOUT 2000 FEET, REFERABLE TO THE *Desert Tundra* (*c*), WHILE THE UPPER HEIGHTS, WITH THEIR PERMANENT SNOW AND ICE FIELDS, FALL WITHIN THE *Polar Desert* (*d*); GLACIER ON THE RIGHT. JANUARY, 1925.

geese he had formerly taken in Baffin Island. The Eskimos have a belief that the largest individuals of *canadensis* occur in the country to the eastward of Lake Harbour, and that the birds become progressively smaller to the westward.

Numerous small flocks and individuals were observed along Soper River in late June and early July—a total of forty-six individuals. Judging by the actions of some of these birds, young were undoubtedly present, but none was seen. One of the Eskimo assistants stated that he saw several downy young following a pair of geese on a grassy flat some distance from the river, but a careful search by the whole party failed to disclose them. The Eskimos stated that large Canada Geese nested on these flats every year. Some of the birds observed and collected were molting and incapable of flight. Those suspected of having young, on the other hand, were invariably strong on the wing, and when pressed too close would fly away and alight on the broad expanse of the river. This same condition and trait were observed two years before with respect to the Blue Goose. The present form evidently nests more or less uniformly all the way along the south coast from Gabriel Strait to Cape Dorset, resorting to islands as well as mainland. On June 17, 1930, Rev. C. L. W. Bailey collected a single egg of the Canada Goose from a nest of four addled eggs at Ashe Inlet, Big Island, which was forwarded to the Royal Ontario Museum of Zoology.

During the course of the expedition nine specimens of *canadensis* were collected. The average length of these is 32.6 inches, and the weight 7.6 pounds; the minimum and maximum lengths and weights were 31 and 35 inches, and 6¼ and 8½ pounds, respectively. Shortt (in Shortt and Peters, 1942: 341) collected an immature *B. c. canadensis* specimen at Lake Harbour on August 17, 1938, and Peters (*loc. cit.*) saw numerous signs of geese in the same locality a year later.

9. **Branta canadensis hutchinsi** (Richardson), HUTCHINS'S (RICHARDSON'S) GOOSE. Eskimo: *Nĕd'lēnŭk''*.—Full details regarding the status of this form, and its rediscovery in southwestern Baffin Island in 1926, cannot be presented here, but the reader can secure this information by consulting earlier publications by the writer (1928: 94–95), Taverner (1931: 37–39) and Kortright (1942: 95–98).

Following the author's observations of this subspecies during the summer of 1926 near Cape Dorset, it was next met with by him in the Nuwata–Cape Weston sector along Foxe Channel in August, 1928. In this locality it breeds rather commonly on small islets in the ponds of the swampy, coastal plain which is here of considerable extent. On August 21 and 22, many small flocks were seen along and near this coast, when the young of the year were nearly full-grown and able to fly. Six specimens were collected with average measurements as follows: Two males—length, 24.00; wing, 12.00; tarsus, 2.75; culmen, 1.27 inches; corresponding measurements of four females—23.70; 11.77; 2.70; and 1.27 inches.

Hutchinsi was next seen the following season in the Bowman Bay locality. The earliest migrants reached Camp Kungovik on June 9, when several small flocks passed over to the north. By June 14 large numbers were inhabiting the surrounding tundra in company with Blue and Lesser Snow Geese and American Brant. At the same time a strong migration flight continued to the north-northwest, parallel to the Foxe Basin coast. This continued up to June 18, after which numbers rapidly diminished until by late June only a few breeding pairs remained. Six examples were collected at this period, with the following average measurements and weights: Three males—length, 25.40 wing, 16.03; tarsus, 2.97; culmen, 1.38 in., weight, 3 lbs. 9 oz.; three females—25.20; 15.02; 2.63; 1.32; 4 lbs.

These birds appear invariably to nest on rocks, hummocks, or islets in the ponds and lakes near the seacoast. I have never seen them nesting elsewhere, and they normally are undoubtedly of marine habit like Snow and Blue Geese. On July 2, a breeding pair was found with nest five miles south of Camp Kungovik; the nest was bulkily constructed of dead grasses and placed on a small, swampy islet in a tundra pond 15 yards from shore; it contained four eggs that had been incubated about a week. Several other mated pairs were observed in the district at this period, assumed to be breeding, but whose nests were not discovered. On July 25, an adult with three downy young about a week old was seen in a lake at Cape Alberta. No others were encountered during the season.

I did not see this form in the Lake Harbour region, 1930–1931. My Eskimo assistant, Moosa, stated that on June 7, 1931, he saw a flock of about forty of these little geese migrating northwestward in the vicinity of Beacon Island. From all available local accounts it appears evident that *hutchinsi* is only a casual migrant in these parts. The Eskimos assert that it never breeds in this region, but passes on to nesting grounds of which they have no knowledge.

As our information stands today, it appears very doubtful if *hutchinsi* nests anywhere in eastern Baffin Island; even as a migrant it is apparently scarce, but, as noted, is common along parts of the western seaboard. The Canada Goose breeds all along the south coast of the island, overlapping the nesting range of *hutchinsi* in the neighborhood of Cape Dorset, or a little farther east, but, so far as ascertained, without tendency to interbreeding. Over northern Foxe Peninsula, and the coastal lowlands at Bowman Bay, *hutchinsi* migrates and nests, apparently, to the complete exclusion of *canadensis*.

10. **Branta bernicla hrota** (Müller), AMERICAN BRANT. Eskimo: *Nĕdlĕŏk"juk'*.—Brant were not seen in Foxe Peninsula during the late summer and fall of 1928. In the spring of 1929 they were first observed at Bowman Bay on June 7, when a flock of twenty-six individuals passed over rapidly to the north. From this date until June 24, the birds were common in the locality as they migrated northward or lingered in the neighbourhood to feed and rest. Small flocks up to twenty-five or thirty birds habitually associated at this time with Richardson's, Blue, and Snow Geese. After the latter date the brant gradually decreased in numbers until they disappeared from the locality in late June. On July 27, however, a pair of adults was seen at Cape Alberta with two downy young about three weeks old. Between Cape Alberta and the mouth of Kommanik River none was noted during early August, but while I was ascending this river on August 13, a pair was observed with two well-grown but flightless young. The following day another pair without offspring was encountered on the river a short distance northwest of Ungmaluktuk Lake. These were the last observed for the season.

In the Lake Harbour region it occurs as a sparing migrant, more frequently noted in the spring. It is not known to breed. No brant were observed in 1930. The following spring, the first intimation of them came with a specimen to the post on June 18; this was shot by an Eskimo at Tanfield Cape where many other individuals were seen at the same time. On June 25, the writer saw a flock of eight birds loitering on a sandbar in Soper Lake, from which a male was taken weighing three pounds. No other record was secured during the summer.

11. **Chen hyperborea hyperborea** (Pallas), LESSER SNOW GOOSE. Eskimo: *Kŭng'ŏ*.—This bird is an abundant migrant over Cape Dorset during the first and second weeks of June. The migration is usually maintained over the mountainous

terrain of this locality at altitudes of 1,000 to 2,000 feet, thence diagonally across Foxe Peninsula to Bowman Bay where a highly concentrated flight persists northward along the east coast of Foxe Basin. In the autumn of 1928 the first observed migrating Snow Geese were a flock of six over Tessikjuak Lake on September 16. Numerous large flocks were noted migrating south at high altitudes over Kingungealuk and Sheneruin Lakes and Andrew Gordon Bay from September 24 to 29, inclusive.

The first geese observed in the spring of 1929 appeared at Camp Kungovik on June 2—a flock composed of eleven Snow Geese and two Blue Geese. After circling and calling loudly for a time in the vicinity, they flew south again. The weather at this date was still decidedly cold and wintry. The next observed was a flock of thirty Snow Geese on June 5, which alighted to feed on a bare strip of tundra on the margin of Blue Goose River. Later in the day another mixed flock of thirty-four appeared. After June 9, the flight of Snow Geese became heavy as they winged their way northwestwardly past Camp Kungovik. Almost invariably the flocks were partly composed of *caerulescens*. From June 9 until June 16 the birds migrated through the region in tens of thousands and numerous large flocks halted for a time in the locality to rest and feed on the patches of snow-free tundra. After June 16 the numbers of Snow Geese gradually diminished until only a small number remained to fly aimlessly about with the large resident population of Blue Geese or to nest in scattered pairs with the latter species.

On June 21, a solitary Snow Goose was found with a nest and one egg on the lowlands near Foxe Basin; the following day another nest was located with one egg. Up to July 3, when sets were complete, several other nests were seen holding from two to five eggs. On the latter date eggs were incubated to a substantial degree. Nests were invariably built on the open, swamp tundra in the vicinity of shallow pools in the same area occupied by nesting Blue Geese. Nests were similar in all respects to those of *caerulescens*, composed of finely plucked tundra mosses, grasses, and chickweed, and invariably of bulky structure, doubtless for the purpose of withstanding the frequent high winds that assail this region.

During the middle of July the birds were tolerably common among large bands of molting "blues." Like the latter the majority were flightless in the summer molt. These carefree flocks were obviously composed of non-breeding birds, presumably one to two years old. Six specimens of both sexes were taken; the average measurements and weights of these are as follows: Length, 27.75 in.; wing (3 only), 16.87; tarsus, 3.52; culmen, 2.23; weight, 5.4 lbs.

On July 20, the first downy young of *hyperborea* were observed on the banks of Blue Goose River. Several broods noted during this and the following three days were composed of from two to five individuals, estimated to be about three days old. In every instance they were accompanied by parents of the same form (no evidence of hybridization), as was also the case with young of the Blue Goose. The downy young of *hyperboreus* are entirely different from those of *caerulescens*, being vivid lemon-yellow except for a slightly dusky cast over the upper parts, including head and neck; feet and legs are dusky vetiver green (Ridgway) with a pale violet cast on the inside of the legs and on the webs of the feet. They may easily be distinguished from the downy young of the Blue Goose at any convenient distance for observation with the unaided eye or binoculars. Neither species was seen anywhere in the region after leaving the Blue Goose Plains in late July.

During the summer of 1938, Manning (1942: 164–167) saw large numbers of Lesser Snow Geese from north of Bowman Bay to and beyond Koukdjuak River. A few were found nesting as far north as Taverner Bay in 1939 and 1940.

Hyperborea occurs very sparingly at times in southeastern districts during the spring and autumn migrations. According to information obtained from white residents at Lake Harbour, it is never plentiful on any migration and some years it apparently does not appear here at all. In 1931, a few small flocks of Snow Geese migrated over Lake Harbour on May 23 and 24. The main migration to the island is much farther to the west by way of Foxe Peninsula.

12. **Chen caerulescens** (Linnaeus), BLUE GOOSE. Eskimo: *Kŭng"ŏvĭk'*.—In the summer of 1929, the breeding grounds of the Blue Goose were discovered by the writer along the east coast of Bowman Bay, Foxe Basin, where it commonly nests on the tundra near the sea in latitude 65° 30'. In company with *hyperboreus*, it was first observed at Camp Kungovik on June 2. Shortly after this date, Blue Geese appeared in estimated tens of thousands as they migrated along the coast to the north or halted to feed and rest along Blue Goose River in the neighbourhood of the camp. In these activities they were invariably associated with large numbers of Lesser Snow Geese. [Since these observations were made, Manning (1942: 163–167) found the Blue Goose plentifully distributed along this coast north of Bowman Bay to Koukdjuak River and less numerous beyond to Taverner Bay. Only a few nest between the two latter points where Snow Geese are greatly in the majority.]

On June 26, the first nests and eggs of Blue Geese were discovered five miles south of Camp Kungovik, in which the sets were incomplete. The colony was revisited on July 3, when all the eggs of the eleven full sets collected were slightly incubated and many other nests were located and studied. Downy young only recently hatched were first observed on July 20.

The Blue Goose was under daily observation in the region of Camp Kungovik from the date of its earliest arrival until the party withdrew from the breeding grounds on July 24. During this period a special study was made of the species, and a large mass of data was accumulated respecting its general habits and activities and numerous specimens were collected, including adults, yearlings, downy young, eggs, and a nest. As a full account of this has already been published (Soper, 1930d), it will not be necessary here to go into further detail. A general narrative by the writer dealing with the search for, and the discovery of, the nesting grounds of this species was published in January, 1930 (Soper, 1930a). For full details regarding present knowledge of the species in Baffin Island, the reader is referred to the above publications and the important paper by Manning (1942). Much new general information has also been assembled in the writer's "Life History of the Blue Goose," published in November, 1942.

The species occurs in migration through the Lake Harbour region in company with the Lesser Snow Goose. Neither bird, however, is ever very numerous in this section, and the Blue Goose is evidently always in the minority. The writer saw nothing of this species in 1931, during the insignificant migration of *hyperboreus* over Lake Harbour the last week of May. The few reported by local Eskimos were seen with Snow Geese migrating in a northwesterly direction over White Strait. The Blue Goose occurs irregularly north to Cumberland Sound and Bylot Island, but there is no definite evidence of its breeding anywhere in these more northern localities.

13. **Anas rubripes** Brewster, BLACK DUCK.—During the course of the Canadian Arctic Expedition of 1934, Mr. E. F. G. White obtained the heads of three Black Ducks at Cape Dorset, Baffin Island, presented by Mr. G. C. Russell, Hudson's Bay Company. The specimens in question were taken by the Eskimo, Keakshook, on

June 8, 1934, about sixteen miles northeast of Cape Dorset. The native intimated that only three Black Ducks were in the group observed, all of which were secured. Mr. White deposited the heads of these birds in the National Museum of Canada for permanent record. This is the first certain record of the species on Baffin Island.

*14. **Anas acuta tzitzihoa** Vieillot. AMERICAN PINTAIL.—On July 25, 1929, I secured a female at Cape Alberta, north coast of Foxe Peninsula. No others of its kind were seen. The solitary bird had resorted to a small coastal lake in the lowlands in company with Old-squaws, and female King Eiders with broods of young. It was in a molting condition with all the wing primaries missing, as well as the longer feathers of the tail. The two Eskimo assistants were greatly surprised to see this bird as neither of them had observed it before, nor had heard about it from other natives. This in itself is sufficient proof that the species here is of exceedingly rare occurrence; the above is the first specimen of this species to be taken on Baffin Island.

15. **Clangula hyemalis** (Linnaeus), OLD-SQUAW. Eskimo: *Ŭg'gŭ"*, or *Ŭg'gŭk".*—Occurs more or less commonly throughout Foxe Peninsula, with its center of abundance on the northwest coast along Foxe Channel. The bird is an especially abundant breeder along that coast between Trinity Islands and Cape Dorchester, and large and numerous broods of young were observed in the lakes about Nuwata in late August, 1928. It is much less numerous along the south coast and in the lakes of the interior. In 1928, the vast majority deserted the region by October 14; a straggler was reported by an Eskimo of Andrew Gordon Bay as late as November 12.

On March 2, an Eskimo seal hunter reported seeing several of these birds at a tide rip several miles southwest of Dorset, associated with a flock of King Eiders. The writer did not see Old-squaws in 1929 until a flock of ten flew over Camp Kungovik on June 9. After June 16, they became increasingly commoner, with a marked migration to the north and northeast. Following June 22, the species was an abundant inhabitant of the surrounding tundra for the remainder of the summer. The soft call of this bird is one of the most memorable sounds of the tundra, and one of the most dominant. All the notes, however, are soft and melodious and are given with a peculiarly hesitant manner. One of the most characteristic calls, as the flocks make their swift and surging flights over the land, is a musical *how-how-how-ung-a-how-ung-a-how-ung-a;* also *ung-a-ung-a* and *hown-a-hown-a*. During early August these ducks were in evidence daily along the north coast of Foxe Peninsula to the mouth of Kommanik River, but were apparently absent from the interior route to Hudson Strait.

In 1930, the species was observed only once, when a flock of twenty-five was encountered in White Strait on August 23. On February 28, 1931, an Eskimo hunter arrived at Lake Harbour with the report that it was fairly common in the open sea about Big Island and off the floe-edge of the mainland coast. This appears to be the earliest spring record of arrival for Baffin Island. Doubtless a few individuals winter in the open waters of Hudson Strait. It was first observed in numbers at Lake Harbour on June 5, 1931. As soon as small ponds and lakes are open, near the coast, the birds at once fly in from the sea and occupy them. Though observed at intervals throughout the summer in all coastal sections visited, and far inland along Soper River, the Old-squaw is not nearly so plentiful in the Lake Harbour region as in the southwestern part of the island. No nests were found, but the Eskimos assert that the species breeds more or less uniformly all along the south and east coasts.

*16. **Histrionicus histrionicus histrionicus** (Linnaeus), EASTERN HARLEQUIN DUCK. Eskimo: *Tŭngăvĭă.*—Prior to the expedition of 1930–1931, this bird had

been observed in Baffin Island only at Cumberland Sound. Though carefully watched for, the species was nowhere seen in southwestern Baffin Island. It was first observed by the writer in the Lake Harbour district on June 5, 1931, when a flock of six, composed of both sexes, was disporting itself in a swift tide-rip at the northern end of Pleasant Inlet. It was next seen at McKellar Bay on June 7, where specimens, as in the first instance, were secured; both sexes were again represented. Another female was taken on June 8, when it was feeding in company with its mate on the margin of a small coastal lake. The largest ovary of this specimen was three-quarters of an inch in diameter, indicating a close approach to nidification. Three more individuals were seen at an open fissure in Soper Lake on June 10. The bird was next noted on July 8, when two females were collected in McKellar Bay. At the extremity of this bay a flock of eleven was noted later the same day; all the birds were playing about in a foaming eddy at the base of a river cataract joining salt water. After this occurrence it was not again noted during the summer.

From the above observations it will be seen that the Harlequin is more common in the southeastern part of the island than formerly supposed. The natives claim that the species occurs throughout the length of the coast from at least White Strait to Gabriel Strait, and is also to be seen in Frobisher Bay; it is said to nest throughout this territory, both along the coasts and in the interior beside tumultuous streams. Based on present information, it appears certain that the Harlequin has a more or less continuous breeding range along the coast from about Crooks Inlet to and about Frobisher Bay and north into Cumberland Sound.

17. **Somateria mollissima borealis** (Brehm), NORTHERN EIDER. Eskimo: *Mĕr"ĭk*.—During early spring, tens of thousands of Northern Eiders frequent the open sea along the land floe of the southern coast of Foxe Peninsula. Here and there they nest on various islands throughout the district in late June and early July. Along Foxe Channel this species is much less numerous and gradually decreases in numbers from King Charles Cape northward to Cape Dorchester, where it is largely replaced by the King Eider, but on the south coast it is the dominant sea duck. The birds continue to haunt tidewater bays and inlets in large numbers until late October, when most of them disappear. A few individuals remain throughout the winter.

Borealis was found very scarce in the Bowman Bay region during the summer of 1929. A small breeding colony was located on July 24, with nests containing from three to five eggs, in which were several young just hatched. Evidently the birds are somewhat later in breeding at Foxe Basin than in Hudson Strait, as the writer saw newly hatched young there in 1926 as early as July 13. Along the north coast of Foxe Peninsula, west of Bowman Bay, the Northern Eider is somewhat more common, where many were seen with broods of downy young in early August.

After incubation has well begun, the males desert their mates and gather in large flocks in the open sea by the middle of July; with them a number of non-breeding females are usually associated. A curious circumstance regarding the males is the fact that they evidently leave the region early in the autumn, many weeks prior to the withdrawal of juveniles and females.

In the summer and fall of 1930, *borealis* was only sparingly observed at Lake Harbour. During the spring, however, these ducks congregate in large numbers along the floe-edge off this section of the coast. In 1931, they were first noted along the margin of the land-fast ice in late February. By May, thousands put in an appearance. The Eskimos report that great numbers nest on the Middle Savage Islands

and in a group of islands west of Big Island. Many other coastal islands are also occupied to the east and west. In the general region of Lake Harbour the most prolific breeding places of these birds, according to Eskimo report, are from Middle Savage to Lower Savage islands. It is said that on some of the islands the nests are so thickly clustered over the surface of the ground that care must be exercised to avoid treading upon the eggs.

In late June and early July a number of individuals and small flocks were observed while I was exploring Soper River; on July 3, a flock of six individuals was encountered on the stream as far inland as the mouth of Livingstone River. In mid-July large numbers were daily met with while I was surveying the coast from Lake Harbour to Philpot Bay. These flocks were composed principally of males, with a generous sprinkling of non-breeding females. *Borealis* not infrequently nests on small islands in freshwater lakes near the coast. The natives report that large nesting colonies of these ducks occur in and about Frobisher Bay, and previous explorations proved the existence of many in Cumberland Sound.

18. **Somateria spectabilis** (Linnaeus), KING EIDER. Eskimo: *Mĕt"ĕlá*.—This is a much less common bird about Cape Dorset than the Northern Eider. It is not known to breed locally anywhere along the coast to the east, but increases in numbers to the northwest along Foxe Channel. *Spectabilis* occurs abundantly from Cape Enauolik to Cape Dorchester (being especially numerous in the Nuwata district), where *borealis* is scarce. The present species is a common breeder on the coastal islands of this territory, and the Eskimos state that it also nests about lakes in the interior. In the autumn it appears in small flocks along the south coast where in summer it is seldom seen. No males were positively identified after October 1, 1928, though numerous females were collected at Cape Dorset during October. Records indicate that no King Eiders have been seen after October 27.

The earliest spring record is for March 2, 1929, when a native seal hunter shot two females at a tide rip near Dorset and reported observing a considerable number in company with Old-squaws. The species was common in flocks at Cape Dorset and Chorkbak Inlet by early May. It was first noted at Bowman Bay on June 9, when two flocks passed north over Camp Kungovik. Flocks composed of both sexes increased in numbers here until June 21, when the birds became very common.

The first unfinished nest of the species was found on June 26. On July 2 one was located with five eggs, which is normally the full complement; individuals have been known to cease laying with three or four. The nests found in this region were situated in the moss of the open tundra, usually not far removed from small ponds, and consisted of simple depressions in the yielding mosses, some with a mixture of dead grasses, and lined with eiderdown. Of the numerous nests found up to July 8, the eggs were invariably in a fresh condition. On July 26, female King Eiders were found tolerably common along the south coast of Bowman Bay, many with downy young three or four days old. During early August, a few were daily observed westward to the mouth of Kommanik River.

As a general rule the female leads in flight, whether a mated pair or in small flocks. In the latter case, male and female alternate, one behind the other, as they fly rapidly in single file. By the latter part of June the first mating calls of the males are heard, which sound similar to *how-it-to-who-who*. The soft and tender andante character of the notes is singularly dove-like in quality and as they are wafted over the calm level of the plain they sound infinitely sweet and melodious. The mellow *who-whos* at times is reminiscent of the suppressed calls of the Great Horned Owl.

The species prevails in large numbers all along the south coast during early spring and then in most sections vanishes completely late in May or early in June, to nest in more northern or western localities. However, the Eskimos state that a few colonies breed on islands in Gabriel Strait and Frobisher Bay. During the nesting season, this length of coastline from the Lower Savage Islands west to Cape Dorset appears to be held almost exclusively by the Northern Eider, which nests here in enormous numbers. Thus it is seen that the two species may observe a meticulous segregation at this period, not only locally but to such lengths that one or the other may be utterly excluded over extensive coastal areas. At the same time, overlapping of local breeding ranges takes place in some localities. A few scattered individuals and small flocks occur in the vicinity of Lake Harbour during the summer but are not known to nest there. The writer never positively identified this species in Baffin Island during the winter, as was the case with the Northern Eider, but a few may winter in the open sea off the ice-bound coasts of Hudson and Davis Straits.

19. **Mergus serrator** Linnaeus, RED-BREASTED MERGANSER. Eskimo: *Pŷle* or *Pte.*—Though far from common, this species is observed occasionally in bays and inlets along the south coast of Foxe Peninsula. Only widely scattered individuals and family groups were met with along the coasts and on interior waters during the late summer and fall of 1928. In 1929, the first pair of spring migrants was observed flying northeastward over Camp Kungovik on June 14. A single bird was noted on Blue Goose River, June 18, and a pair in the same locality a week later. The species was not again observed during the season.

In August and September, 1930, a few scattered examples were noted from Lake Harbour to White Strait, and a solitary individual in Pleasant Inlet on September 20. This was the latest date the species was seen. In 1931, it was first noted at Lake Harbour on June 4. Throughout the summer it was sparingly observed on various lakes of the district, far inland along Soper River, and in coastal waters from White Strait to Philpot Bay. No nests were found, but the birds breed throughout the region.

(*To be continued*)

MOURNING DOVES IN NEBRASKA AND THE WEST

BY H. ELLIOTT MCCLURE

THE life-history study of the Mourning Dove, *Zenaidura macroura* (L.), which was begun in Iowa in 1938, has been continued as opportunities presented themselves over a period of seven years. The most intensive investigation concerning their habits was carried on at Lewis, Iowa, through 1940 (McClure 1942, 1943). From 1941 through 1943, nesting habits and population movements were observed in central Nebraska in the vicinity of Ord. Enlistment in the Navy interrupted this work, but the bird has been watched during a tour of duty extending over several months in California.

METHODS

Full time was given to the nesting studies at Lewis. Each nest was observed every other day until it was no longer in use. Loca-

tions of all nests were closely watched as they often served for the sites of new nests.

At Ord, only spare moments could be given to dove watching, mainly evenings and week ends. Not quite four hundred nestings were observed at three widely separated localities. Whereas the bulk of the nests under observation at Lewis were built in town, the three nesting localities in Nebraska were all rural.

Finally, while the writer was stationed at San Diego, California, ten dove nests came under observation and data concerning them are included here.

Comparison of Nestings at Lewis and Ord

This report covers 4,273 separate nesting attempts and data from these are shown in Table 1. There was only one per cent difference between Iowa and Nebraska in the number of eggs that hatched, 54.6% and 53.6%, respectively. The limited studies at San Diego showed a higher hatch and a very high nesting success. Average nesting success in Iowa was 47.9%, in Nebraska 47.0%, while seven of the ten nests at San Diego were successful. There was very little variability in the success of rearing young and the seven-year average was 85.3%.

The dove is preeminently an adaptable bird and its choice of a nesting site reflects this. Within Lewis the trees were old and tall and the average trunk diameter of those chosen for nest locations was 19.0 inches. In the country in Iowa, mainly smaller trees were available and the average trunk diameter was 14.6 inches. In Nebraska, trees are smaller from lack of moisture so the average size of those used was 10.2 inches. Heights of nests were determined by the same phenomenon. In Lewis the average nest height was 22.7 feet, in the Iowa rural locations it was 15.1 feet, while at Nebraska sites it was 9.3 feet. The average height of nests determines the average distance from the center of the tree, since higher nests are placed farther out on the limbs. In Lewis, this distance was 13 feet; at Iowa country locations it was 9.5 feet; and in central Nebraska it was 5.0 feet.

In Iowa there is a more equitable distribution of strong winds throughout the nesting months, predominantly northwest in spring and fall and southwest in summer, with occasional storms from the northeast and southeast. Because of this the average nest position as related to the wind was not conspicuously on one side or another. During any given month of strong winds, the bulk of the nests would be built to the leeward. In central Nebraska, wind is a daily event,

TABLE 1

TOTAL MOURNING DOVE NESTING ACTIVITIES OBSERVED OVER A SEVEN-YEAR PERIOD

Year	*Number nests*	*Number nestings*	*Number eggs*	*Number eggs hatched*	*Per cent hatch*	*Number young raised*	*Per cent young raised*	*Number nesting successes*	*Per cent success*	*Number young per nest*	*Number young per nesting*
Vicinity of Lewis, Iowa											
1938	1108	1464	2870	1722	60.1	1502	87.3	810	55.5	1.355	1.02
1939	1443	1975	3595	1858	51.7	1583	85.2	877	44.9	1.097	0.80
1940	326	439	799	392	49.0	309	78.6	168	38.3	0.85	0.70
Total	2877	3878	7264	3972	54.6	3394	85.4	1855	47.9	1.18	0.87
Vicinity of Ord, Nebraska											
1941	27	27	54	22	40.7	17	77.2	9	33.3	0.63	0.63
1942	86	103	210	110	52.4	89	80.9	50	48.5	1.03	0.86
1943	212	255	470	262	55.7	221	84.3	122	48.0	1.04	0.86
Total	325	385	734	394	53.6	327	83.0	181	47.0	1.00	0.85
San Diego, California											
1944	10	10	20	13	65.0	13	100.0	7	70.0	1.30	1.30
Grand total	3212	4273	8018	4379	54.6	3734	85.3	2043	47.9	1.16	0.87

with many strong blows predominantly west and northwest. The birds responded to this, since it is easier to build on the leeward than windward side of a tree. Twenty-four per cent of the nests were on the north, 30% on the east, 31% on the south, and 15% on the west.

In Iowa, all of the trees of an area totaling more than 200 acres were closely watched and the average usage by doves determined. In Nebraska, such an intensive method was not possible and data concerning relative use by the species are not at hand. Tables 2 and 3 list the species of trees used in the vicinity of Ord. The list varies between 1942 and 1943 in relation to the localities and intensity of observation.

At Lewis (Table 4), the American elm was the most abundant tree, constituting 32.5%, and similarly it supported the most nests, 45%. Other trees bore the same relationship to their usage, but red pine and Norway spruce were preferred and were sought out by doves. At the rural locations the situation was somewhat different. Here the deciduous trees were in use inversely proportional to their numerical status, while the introduced red pine was the preferred species for dove nesting. In Nebraska, the relationship between tree numbers and dove nesting was obscured by the type of locality selected for study. Elms supported 26% of the nests, but the elm is not the most common tree. Elms at the Aagaard farm bore enough nests to distort the picture. The same is true of white and blue spruce. Both were present as a windbreak at the Koupal Garden, a much preferred nesting place for doves. The fact that cottonwoods supported nine per cent of the nests in Nebraska and less than one per cent in Iowa is more closely related to availability. The bulk of Nebraska's windbreaks or groves are made up of cottonwoods. Nests in artificial positions such as eavestroughs or man-made structures made up hardly one per cent of the total in Iowa, but in Nebraska nests beneath bridges on the supporting girders constituted five per cent of the total.

The Mourning Dove is prone to use its old nest repeatedly, especially if it has been a satisfactory site for the previous attempt. In Iowa, 25.7% of all nests were used more than once, while in Nebraska this figure was 19.1%. Multiple usage of nests went to greater heights in Iowa than in Nebraska, probably because large numbers of nests were under observation. During the Iowa study, 74.3% of the nests were used once, 18.8% twice, 5.3% three times, 1.3% four times and 0.3% five times. In Nebraska, 80.9% were used once,

TABLE 2

MOURNING DOVE NESTING IN THE VICINITY OF ORD, 1942

Nest site	*Species*	*Number trees*	*Number nests*	*Number nestings*	*Number successful*	*Average height*	*Average distance from center of tree*	*Average diameter of tree*
Elm	*Ulmus* spp.	27	28	36	21	9 ft.	5.5 ft.	9.5 in.
Blue Spruce	*Picea pungens*	16	18	19	7	8	3	8
White Spruce	*Picea* spp.	12	12	13	4	9	4.5	10
Box elder	*Acer negundo*	8	8	9	5	9	8	11
Cottonwood	*Populus deltoides*	3	3	3	0	11	1	16
Hawthorn	*Crataegus* sp.	2	2	3	0	5	3	
Austrian pine	*Pinus* sp.	2	2	2	0	8	6	9
Scotch pine	*Pinus sylvestris*	2	2	2	1	9	9	12
Apple	*Pyrus malus*	1	1	2	2	9	10	14
Mulberry	*Morus rubra*	1	1	2	2	3	3	
Willow	*Salix* sp.	1	1	1	0	6	3	10
Chinese elm	*Ulmus parvifolia*	1	1	1	1	6	1	3
Soft maple	*Acer saccharinum*	1	1	1	0	40	10	30
Bridges	(4 bridges)		4	7	5			
Ground			1	1	0			
Grapevine	*Vulpina* sp.		1	1	1			
Total		77	86	103	50	9.0	4.8	9.8

TABLE 3

DOVE NESTING IN THE VICINITY OF ORD, 1943

Nest site	*Species*	*Number trees*	*Number nests*	*Number nestings*	*Number successful*	*Average height*	*Average distance from center of tree*	*Average diameter of tree*
White spruce	*Picea* spp.	41	47	56	21	9.0 ft.	4.5 ft.	8.5 in.
Elm	*Ulmus* sp.	33	41	62	33	10.8	5.0	9.0
Cottonwood	*Populus deltoides*	31	31	31	18	13.0	5.0	17.0
Blue spruce	*Picea pungens*	14	23	28	12	9.0	4.0	11.0
Box elder	*Acer negundo*	9	11	16	10	10.7	7.0	10.0
Apple	*Pyrus malus*	9	9	12	7	9.0	9.0	13.5
Bridge	(6 bridges)		8	12	9			
Plum	*Prunus* sp.	7	7	9	3	4.0	1.0	1.7
Hawthorn	*Crataegus* sp.	4	4	6	0	7.0	9.5	3.5
Honeysuckle	*Lonicera* sp.		2	2	2	5.0		
Mulberry	*Morus rubra*	1	2	2	0	4.0	1.5	
Ash	*Fraxinus* sp.	1	1	2	2	10.0		4.0
Honey locust	*Gleditsia tricanthos*	2	2	2	1	11.0	4.0	6.0
Willow	*Salix* sp.	2	2	2	1	4.0	5.0	8.0
Scotch pine	*Pinus sylvestris*	1	1	1	0	8.0	12.0	12.0
Cherry	*Prunus avium*	1	1	2	2	6.0		8.0
Juniper	*Juniperus* sp.	2	2	1	2	4.5	1.0	5.0
Chinese elm	*Ulmus parvifolia*	1	1	1	0	5.0		3.0
Austrian pine	*Pinus* sp.	1	1	1	0	4.0	5.0	10.0
Ground			1	1	0			
Total		160	197	250	122	9.6	5.1	10.6

15.7% twice and 3.4% thrice. None was noted in use more than three times.

The nests of other birds did not play as important a part in the economy of doves in Nebraska as they did in Iowa. Nor was the dove-robin relationship as evident. Only 11 of 325 nests, 3.7%, in Nebraska were built in those of other birds while 10.3% of Iowa's nests were in other avian structures. Nests used in Nebraska were Brown Thrasher (*Toxostoma rufum*), 2; Yellow-billed Cuckoo (*Coccyzus americanus*), 1; Bronzed Grackle (*Quiscalus versicolor*), 2; English Sparrow (*Passer domesticus*), 1; Robin (*Turdus migratorius*), 4; and Migrant Shrike (*Lanius ludovicianus*), 1.

TABLE 4

A COMPARISON OF TREE AVAILABILITY AND USE FOR NESTING BY DOVES

	IOWA				*NEBRASKA*
	In town		*In country*		*In country*
Trees	*Per cent of trees*	*Per cent of nestings*	*Per cent of trees*	*Per cent of nestings*	*Per cent of nestings*
Elm	32.5	45.0	10.0	5.5	26.0
Box elder	15.3	12.9	8.0	5.1	6.5
Silver maple (*Acer saccharinum*)	7.0	7.6	11.0	9.8	
Red Pine (*Pinus resinosa*)	1.0	6.6	11.0	27.7	
Apple	10.0	5.6	14.0	11.0	3.6
Norway spruce (*Picea abies*)	0.8	4.1	3.0	7.0	
Plum	5.0	1.6	12.0	7.5	2.4
Red mulberry	1.2	1.1	3.0	4.6	0.6
Scotch pine	0.6	1.0	9.0	4.1	0.8
White spruce	0.2	0.4	0.7	0.6	15.0
Blue spruce	0.4	1.0	0.2	0.1	12.0
Willow	1.1	0.0	1.0	0.2	3.6
Cottonwood	0.4	0.4	3.0	0.0	9.0

NESTING AT KOUPAL GARDEN

The Koupal Garden was a favorite nesting place for doves at Ord. It was at the edge of town, had an area of about three acres, and had originally been planted as landscaping for a country home which was never built. A border of elms on three sides, overlooking a small creek to the west, enclosed small apple orchards at the northern and southern ends. These were separated from the central flower garden by several rows of densely planted blue and white spruces. Other ornamental deciduous and evergreen trees were included and to the west of the formal flower garden was a pool.

Proximity to water and grain fields, and dense trees served to make this an ideal bird haven, except that it also supplied needs for marauding feral cats, Blue Jays (*Cyanocitta cristata*) and Crows (*Corvus brachyrhynchos*). Fox squirrels (*Sciurus niger*) were present,

but did not appear detrimental to the nesting efforts of Robins, Yellow-billed Cuckoos, Catbirds (*Dumetella carolinensis*), Brown Thrashers, Red-winged Blackbirds (*Agelaius phoeniceus*), Bronzed Grackles, Crows (*Corvus brachyrhynchos*), Cardinals (*Richmondena cardinalis*), *Arkansas Kingbirds* (*Tyrannus verticalis*), Mourning Doves and others. Forty-two dove nestings in 1942 and 110 in 1943 were observed to have a success of only 38%. In the presence of many evergreens, elms were not frequently chosen as nest sites (Table 5). The average size of the trees used and the location of nests did not vary much during the two years, as would be expected in a small area (Table 6). Because of the location of the garden, beneath protecting hills, a majority of daily winds blew from the north and 45% of the nests were built on the south side of trees. Aside from weather, feral cats and Blue Jays appeared to be the worst enemies of the dove. Multiple nesting reflected this poor success. Only one nest in two years was used three times and only 22, or 17%, were used twice.

Nesting at the Aagaard Farm

Situated five miles north of Ord, in the upland dryland-farming region, the nesting habitat at Aagaard's farmyard was very different from that at Koupal's, amid valley, irrigated-farm conditions. Here the expanse of rolling treeless hills was broken only by an occasional clump of elms, box elders or cottonwoods about a farm house or in a gully. At Aagaard's, an east-exposed slope above a dry-run creek supported a sparse growth of elms, box elders, soft maples and ash. The planting was about two hundred yards long by 25 yards deep. The only water available was in a near-by duck pond, filled several times each summer by heavy rains. The surrounding clay hills were cultivated to corn and small grains.

Mourning Doves, Arkansas Kingbirds, Migrant Shrikes, English Sparrows, Robins, and other birds sought this bit of cover as well as others about similar farmyards. Here the predator factor was greatly reduced as all stray cats were shot and Blue Jays were not common. As Table 7 indicates, dove production responded to this protection and 60% of 107 nesting attempts over two years were successful. As the largest trees, with the most desirable nesting sites, were elms, they were used most extensively. Nearly 80% of the dove nests were built in them. Since nearly all of the trees were used each year, the average nest location did not vary greatly (Table 6). Because of the exposed location of the grove, west winds swept it and 37% of the nests were built on the east side of the trees.

TABLE 5

RECORDS OF NESTING FOR 1942 AND 1943 AT KOUPAL GARDEN, ORD, NEBRASKA

Site	*Number nests*		*Number nestings*		*Number successful nestings*		*Two-year percentage of success*
	1942	1943	1942	1943	1942	1943	
Blue spruce	18	23	19	28	7	12	40
White spruce	12	47	13	56	4	21	36
Scotch pine	2	1	2	1	1	0	33
Austrian pine	2	0	2	0	0	0	0
Hawthorn	2	4	3	6	1	0	14
Apple	1	7	2	10	2	6	66
Grapevine	1	0	1	0	1	0	100
Elm	0	5	0	5	0	1	20
Honeysuckle	0	2	0	2	0	2	100
Cherry	0	1	0	2	0	2	100
Total	38	90	42	110	16	44	38

TABLE 6

AVERAGE LOCATIONS OF NESTS UNDER OBSERVATION AT ORD

Year	*Diameter of tree*	*Height of nest*	*Distance from center of tree*	*Percentage of Nests on:* *North*	*East*	*South*	*West*
			KOUPAL GARDEN				
1942	9.0 in.	8.3 ft.	4.1 ft.	14	30	50	6
1943	9.5	8.9	5.0	19	20	42	20
			AAGAARD FARMYARD				
1942	10.0 in.	9.4 ft.	6.2 ft.	20	37	13	30
1943	9.0	10.7	4.2	31	37	18	14
			MISCELLANEOUS				
1942	12.0 in.	10.5 ft.	3.5 ft.	37	45	9	9
1943	11.8	8.5	6.4	21	14	58	9

TABLE 7

RECORDS OF NESTING FOR 1942 AND 1943 AT AAGAARD FARMYARD, ORD, NEBRASKA

Site	*Number nests*		*Number nestings*		*Number successful nestings*		*Two-year percentage of success*
	1942	1943	1942	1943	1942	1943	
Elm	25	31	34	50	20	28	57
Box Elder	5	6	6	10	4	8	75
Mulberry	1	2	2	2	2	0	50
Juniper	0	1	0	1	0	0	0
Ash	0	1	0	2	0	2	100
Total	31	41	42	65	26	38	60

There appeared to be little competition between doves and Arkansas Kingbirds. At least six pairs of these raucous tyrants nested each year in the same trees as did the doves and no conflicts were noted. In 1943, Migrant Shrikes built their nest in a favored dove

TABLE 8

Records from Nests at the Dunne Ranch, Loup Co., Nebraska, for 1942 and 1943

Site	*Number nests*		*Number nestings*		*Number successful nestings*		*Two-year percentage of success*
	1942	1943	1942	1943	1942	1943	
Chinese elm	1	1	1	1	1	0	50
Elm	1	4	1	6	0	3	43
Ground	1	0	1	0	0	0	0
Cottonwood	1	28	1	28	0	17	58
Plum		7		9		3	33
Apple		2		2		1	50
Box elder		1		1		0	0
Honey locust		2		2		1	50
Austrian Pine		1		1		0	0
Total	4	46	4	50	1	25	48

site. They raised four young and moved to an adjoining elm for the second brood. Doves took up their first nest and raised a pair of young. The dove's second clutch of eggs at this site was eaten by a wandering fox squirrel. In the meantime another pair of doves built a nest within five feet of the shrike nest containing three ravenous youngsters. The young doves hatched but disappeared in a day, it was suspected down the throats of the shrikes, but we saw no direct evidence of this. At no other time were the shrikes suspected

TABLE 9

Records from Nests in Miscellaneous Sites in the Vicinity of Ord, Nebraska

Site	*Number nests*			*Number nestings*			*Number successful nestings*			*Three-year percentage of success*
	1941	1942	1943	1941	1942	1943	1941	1942	1943	
Willow	10	1	2	10	1	2	4	0	1	38
Ash	7	0	0	7	0	0	2	0	0	30
Elm	3	2	1	3	2	1	2	1	1	66
Juniper	2	0	1	2	0	1	1	0	1	66
Grapevine	2	0	0	2	0	0	0	0	0	0
Ground	2	1	1	2	1	1	0	0	0	0
Cottonwood	1	2	2	1	2	2	1	0	1	40
Box elder	0	3	4	0	3	5	0	1	2	38
Soft maple	0	1	0	0	1	0	0	0	0	0
Bridge	0	4	7	0	7	12	0	5	9	73
Total	27	14	18	27	17	24	10	7	15	47

of attack on doves and following the flight of their second brood this nest, too, was used by doves.

As desirable nest locations were at a premium and nesting success was high, a large percentage, 37.5%, were used more than once. Seven, or nearly 10% in two years, were used three times.

NESTING AT THE DUNNE RANCH

A third study area was situated 65 miles northwest of Ord, at the Will Dunne Ranch on the Calamus River, amidst sandhill range country in Loup County. Here a windbreak of young and aging cottonwoods protected a small plum orchard and the ranch buildings. A dense undergrowth of wild plum grew beneath these trees which enclosed an area of approximately ten acres. Except for another windbreak, this was the only woody cover for ten or twenty thousand acres of unbroken sandhill grassland. The Calamus River, bordered by occasional low willow thickets, flowed within a few rods of the grove and abundant sunflower (*Helianthus* spp.), wild sweet pea (*Lathyrus* sp.), and other native plants furnished a readily available food supply.

Abundant wildlife used this oasis-habitat including doves, Crows, Sparrow Hawks (*Falco sparverius*), Pheasants (*Phasianus colchicus*), Prairie Chickens (*Tympanuchus cupido americanus*), Sharp-tailed Grouse (*Pedioecetes phasianellus*), Brown Thrashers, grackles, Red-headed Woodpeckers (*Melanerpes erythrocephalus*), Bell's Vireos (*Vireo belli*), Blue Grosbeaks (*Guiraca caerulea*), and many others. (A discussion of this island habitat is to be prepared later.) No systematic search for dove nests was made in 1942 as in 1943. Table 8 lists information concerning nesting here and it will be noted that just half of the 1943 attempts were successful. Cottonwood, which was the most abundant large tree, was most used. Plum trees were uniformly too low to be desirable as nesting sites and success in them was low. Cottonwood groves in Iowa were rarely used by doves, because more desirable types of trees were nearby. In this region of Nebraska, doves must choose between cottonwoods or the ground, and so select the trees. Ground nesting was not common, even out here. Multiple use of nests did not occur and only one nest was used more than once (three times) in the two years.

BRIDGE NESTING

Table 9 lists information concerning nests observed at miscellaneous locations near Ord for the three-year period.

In 1942, while I was examining the supporting stringers of bridges for phoebe (*Sayornis* spp.) nests, it was found that doves, too, were using the upper surfaces of girders and ledges as nesting sites. Dove nests are not commonly found associated with man-made structures. In Iowa, one was located in a bird shelter, one on a transformer attached to a light pole, and one was in an abandoned, broken electric sign.

However, eaves troughs were attractive to birds in town and 0.6% of all nests were built in them. The peak year for nesting in eaves troughs was 1940 (McClure 1944) and they supported 4.3% of the 439 nestings. A direct comparison of this type of nest selection with the use of bridges in Nebraska is hardly warranted as bridges were sought out and searched for dove nests. Of 385 nestings observed through the three years, 5% were on the under surfaces of bridges. Since the same positions in the same four bridges came into use for two consecutive years, it appears that the same pairs of birds were involved. Success of nestings in eaves troughs was 54% in spite of the drowning hazards involved. Bridge locations appeared very desirable, for 73% of the nesting attempts were successful.

Nesting at San Diego, California

Upon being stationed at the Naval Hospital Corps School in Balboa Park at San Diego, in July, 1944, I was immediately attracted by the numbers of doves present. We were restricted to an area of not more than thirty acres and this was ornamented with queen palms (*Areca* sp.), date palms (*Phoenix* sp.), monkey-puzzle trees (*Araucaria* spp.), banana trees (*Musa sapientum*), and numerous other exotics. In typical dove fashion the birds were utilizing what was available. Five of the ten nests found were in palms and the remainder in California pepper trees (*Schinus molle*), on the roofs of a herbarium, in banana trees, and in other trees. The tops of waving fronds were very satisfactory nesting sites until the frond began to wilt. One nest was pitched out this way. Mild weather and lack of predators permitted the doves to complete seven of their ten nestings. The average diameter of tree chosen was 13 inches; the average nest height was 18.6 feet; and the average distance from the trunk was 9.5 feet. Probably 20 eggs were laid, from which 13 young hatched and flew when fully fledged.

The numbers of doves flying about the grounds were counted each day from July 23 through October 9. The population appeared

TABLE 10

Average Number of Doves Counted Each Day at Balboa Park, San Diego, California in 1944

Week of:	*Number doves*	*Week of:*	*Number doves*
July 29	52	Sept. 9	43
Aug. 5	60	Sept. 16	23
Aug. 12	70	Sept. 23	47
Aug. 19	71	Sept. 30	16
Aug. 26	49	Oct. 7	38
Sept. 2	22		—
		Average	44

somewhat erratic as the birds would come and go from the park, but the average number seen each day increased through the week of August 19. The figures in Table 10 seem to indicate that the birds passed through the park in waves—each wave, possibly a migration wave, followed by an ebb. The average daily count was 44, and was as high as 71 during the week of August 19 and as low as 16 during the week of September 30.

SEASONAL ABUNDANCE IN NEBRASKA

Between March, 1941, and April, 1944, I drove over 77,000 miles along the highways and trails of central Nebraska. Other sections of the state were periodically covered, but the bulk of driving was

TABLE 11

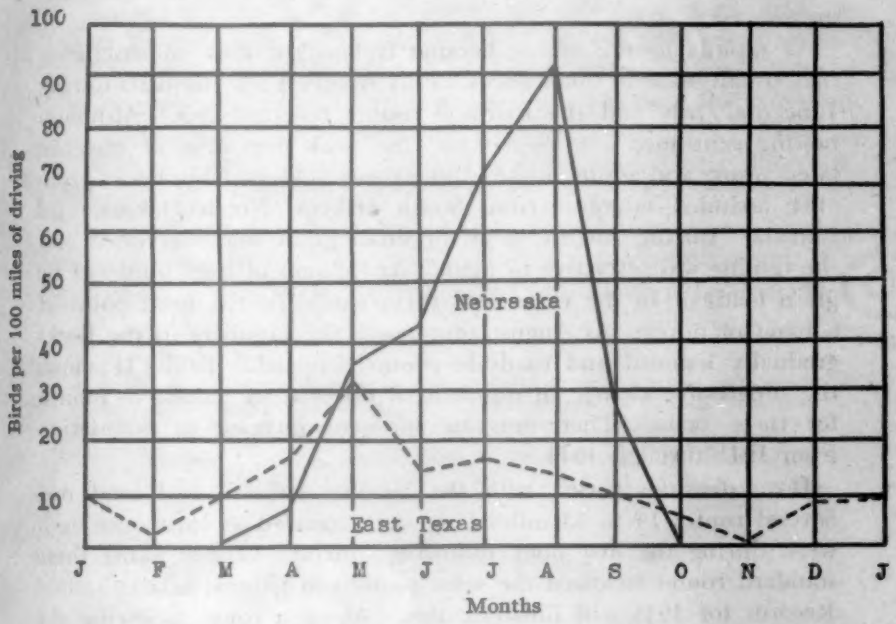
A COMPARISON OF MOURNING DOVE ABUNDANCE AS INDICATED BY ROADSIDE COUNTS IN TEXAS AND NEBRASKA. FIGURES INDICATE THE NUMBERS SEEN PER HUNDRED MILES OF DRIVING

	EAST TEXAS (FROM SIEGLER)				*CENTRAL NEBRASKA*				
Month	*1939*	*1940*	*1941*	*Average*	*1941*	*1942*	*1943*	*1944*	*Average*
Jan.		7.8	11.7	9.8					
Feb.		3.9	1.0	2.4					
Mar.		3.9	15.6	9.7		.06		.06	.03
April		18.6	15.6	17.1	.05	4.8	21.5	6.6	8.24
May		29.0	35.3	32.1	6.5	45.5	50.5		34.2
June		4.9	25.5	15.2	1.3	60.7	69.1		43.7
July		7.8	26.4	17.1	28.5	91.1	96.2		71.9
Aug.		13.3	14.7	14.0	51.0	91.7	130.7		91.1
Sept.	11.7	9.8		10.6	20.0	33.0	31.6		28.2
Oct.	5.8	5.8		5.8	0.3	0.5	0.6		0.5
Nov.	1.0	1.0		1.0					
Dec.	1.0	17.6		9.3					
Average		8.6	13.8	11.2	18.0	46.0	58.6		33.5

done in this area. All doves seen from the car to a distance of approximately 100 feet on either side of the road were tallied. The three-year total included 19,259 birds.

Roadside counts have been conducted by Nice (1921 and 1922), Siegler and Newman (1944), and others. Siegler and Newman reported on two years of roadside counting in east Texas. Their tally averaged 510 per month. Siegler concluded that roadside counts "during only two years will not reveal relative population densities from one season of the year to the next. Such counts provide general impressions as to the relative abundance of doves between two major plant zones." I am not in complete agreement with him on the first statement, for similar counts in Nebraska do seem to me to reveal not only actual seasonal fluctuations and densities, but total population trends. It may be that the difference in count, 500 per

month for him and 2,000 per month for me, would alter the data. If roadside tallies over a long period and many repeated miles will provide "general impressions as to the relative abundance of doves between two major plant zones" (which Nebraskan data substantiate), then it seems reasonable to assume that they would reveal population trends. Table 11 compares data from the two sections of the country. Thus it is evident that the average number of birds seen



TEXT-FIGURE 1. Comparison of Mourning Dove populations in east Texas and Nebraska as reflected in roadside counts.

during one hundred miles of driving in Texas was below 15. Peak populations occurred during May when it would be expected that the mass of doves wintering in Mexico would filter through the state. This migration moves on into the north as is reflected in the Nebraska figures. Text-figure 1 demonstrates this. Heavy breeding in the north increases the population, and migration back through Nebraska brings the peak for the year in August. But this movement was not reflected in Siegler's data and it should have been, as banding records show that the birds pass through Texas in their journey to Mexico. Judging from his records, the breeding and resident population was surprisingly uniform for the year. The low population

of November was probably brought on by a general southward shift of the birds from hunting pressure.

The Mourning Dove was present in Nebraska from March through October. A few individuals wintered in small flocks in the southeastern counties. In other parts of the state the first birds appeared during the last ten days of March. Nesting began in April and continued until about the 25th of September. Nesting in southwestern Iowa began in March and continued for at least fifteen days longer than in Nebraska.

As rapidly as the young became full-fledged and self-sustaining they congregated in small flocks. Peak numbers left the nests during June and July and the roadside counts reflected this. Although nesting continued into September, the peak migration of accumulated young and adults occurred in August. These large flocks probably included migrants from South Dakota, North Dakota, and Canada. During August, fields of small grain were harvested and the residue was attractive to them. Any clump of trees bordered by grain fields or in the vicinity of them would be the focal point of a band of doves. As August progressed, the numbers in the flocks gradually lessened and roadside counts dropped. Table 11 shows the progressive change in numbers of doves from month to month for three years. There was an apparent increase in population from 1941 through 1943.

Dove densities varied with the locality, habitat, and land use. Several routes 15 to 33 miles long were traveled at least once each week during the first hour following sunrise. Counts along these standard routes followed the same pattern as general all-day tallies. Records for 1943 will illustrate this. Along a route following the North Loup River valley for 33 miles, an irrigated corn, alfalfa, and sugar-beet area, the dove population remained uniform for three months. During June it averaged 1.9 birds per mile; July, 1.8 birds; and August, 1.9 birds per mile. Migration during August and September brought the September count down to 0.2 birds per mile. Dove populations along a thirty-mile route through sandhills were smaller, averaging 0.7 birds per mile in June, 1.6 per mile in July, and dropping rapidly to zero per mile by September.

Ord is situated in the North Loup River valley and to the north and south of it are dry-land farming regions of corn, small grain, and grazing. Along a fifteen-mile route to the north, the dove-per-mile counts were: July, 3.0; August, 1,6; and September, 0.2. This route traversed more grazing than farming land. A route fifteen

miles long, south of Ord, went through farming country with a higher percentage of small grain than on that north of town. Here the dove-per-mile count was: July, 4.7; August, 4.8; and September, 1.1.

Use of the Nest Census Method

Following the 1938–1940 study, an attempt was made to develop a census method based upon the number of active nests which an observer could find in a given area. The total number of nesting attempts for the year was divided by the average number of active nests counted each day of the month. For example, if we assume that the average yearly number of nesting attempts was 1,000 and the average number of active nests each day for June was 200, then the nesting factor for June would be 1,000 ÷ 200 or 5. Table 12 gives these nesting factors as they were determined from Iowa and Nebraska data.

In compiling data from Nebraska, a similar method was used to compute these factors. The similarity in factors for each month over a five-year period in two states is striking. That data from 4,000

TABLE 12

Relationship between the Average Daily Active Nests and the Season's Total Nesting Attempts. These Factors Multiplied by the Number of Active Nests Indicate the Estimated Season's Production

Month	*Lewis, Iowa*	*Ord, Nebraska*	*Average*
April	75.0	119.3	97.2
May	10.8	11.5	11.1
June	6.6	7.0	6.8
July	7.2	7.3	7.2
August	8.6	6.3	7.5
September	14.5	20.0	17.2

nestings in Iowa and 400 in Nebraska should show factor differences of only 6% or less, certainly would lead one to believe that we have here a fundamental relationship between the number of nests in use on any day and the total number of nesting attempts. There was a difference of 6% between the two studies for May and June and only 1% for July. Apparently we may assume that nest censusing for this species can best be accomplished during these months.

If the factors involved have wide application, and we know from observation that they do at this latitude and for an area with a radius of at least five hundred miles, the population estimates of doves become relatively simple. The steps involve a simple count of all of the active dove nests in a sample area during May, June, or July, preferably the last two, and the use of the factor for that month. Determination of total nest production from year to year

can serve as an index of the dove population. If the numerical status of the bird is desired, the number of nestings determined may be multiplied by 0.87 to give the total young produced. Adults involved are more difficult to calculate since our data are less accurate here. However, the average number of nesting attempts per pair is conservatively placed at six; therefore, dividing the total number of nestings by three and adding the result to the number of young will give a usable estimate of the population from the sample area. Each additional figure involved increases the range of error, so the use of the total numbers of nestings would be the most accurate tally method from year to year.

Very few cautions need to be observed with this method. First, avoid making nest counts after storms. It is advisable to tally nests after a week or so of calm or mild weather. Second, if time permits, continue the tally in one area for several counts over a period of days or weeks. An average of these will smooth the irregularities from year to year. Third, make the sample area large enough to obtain an overall picture of the dove population. This should involve a large acreage of diverse habitats or a number of small plots including samples of each habitat in ratio to its importance in the region.

In 1941 we moved from Lewis to Ord. We returned to Lewis in May and on May 11 I checked nearly all of the trees in the 160 acres of town site for dove nests. A total of 55 was counted and I allowed five more for small areas not surveyed. Using the factor for May, 10.8, the total nestings indicated by this count amounted to 648. The three-year average for Lewis had been 1,320 nestings. Apparently the method was inaccurate. It was known that May had been cold and wet and that dove nesting was late. Obviously, a single day's count early in May was not sufficient to estimate the season's yield, or the dove population was far below par.

We returned in June, and on the ninth I had only a few minutes available for a quick survey. I selected four acres in the part of town where I knew nesting to be greatest. Thirteen nests were counted. To this was applied the factor for June, 6.6, and the estimated total was 85.8. The average per acre was 21.4. The three-year average for this locality had been 27 nestings. Hence, the estimate was well within range of this. Upon closer examination of the data we see that the count was made on June 9, and June is a month of increasing dove nesting. As this date is as close to May as to the middle of June, the error would be toward too few nests,

so it would be advisable to add the May and June factors and divide by two; *i.e.*, 10.8 plus 6.6 divided by 2 equals 8.7. Thirteen nests multiplied by 8.7 equals 113.1, which, in turn, divided by 4 gives a figure of 28.2, the average number of nestings per acre for 1941; a figure very close to the three-year average. In other words, the method is usable if it is tempered by a knowledge of the Mourning Dove nesting habits. That the four acres was too small is shown by the fact that the average number of nestings per acre for all of Lewis was 8.

On May 6, 1945, a brief survey of Koupal's Garden at Ord revealed eight nests. Using the average factor for May, 11.1, the estimated number of nestings would be 88.8, within range of the 110 found in 1943.

SUMMARY

1. A study of Mourning Dove habits was continued in central Nebraska, 1941 through 1943. As spare time was used for this study, only 385 nestings were observed.

2. This report covers records on 4,273 nestings. Average success was 47.9%; 85.3% of the young flew from their nests.

3. In central Nebraska, the average diameter of trunks of trees used was 10.2 inches at breast height, the average height of nests was 9.3 feet, and the average distance from the center of the tree was five feet. Of the nests, 24% were on the north, 30% on the east, 31% on the south, and 15% on the west side of the trees.

4. In Nebraska, 19.1% of all nests were used more than once; 80.9% were used once, 15.7% twice, and 3.4% three times.

5. At Ord, a favorite nesting place was in Koupal's Garden where blue spruce and white spruce were the most popular trees. Nesting success here was 38%.

6. At the Aagaard farm north of Ord, elms were the predominant tree and were most heavily used. Of the nestings, 60% were successful. Strong west winds forced doves to build 37% of their nests on the east.

7. At Dunne's Ranch in the sandhills, a cottonwood grove furnished nesting places for many birds. Nesting success here was 50%.

8. In the three-year study, 5% of the nests found were beneath bridges on supporting girders. These nests had a success of 73%.

9. Ten nests observed in Balboa Park at San Diego, California, were built in palms and other trees and were 70% successful. One hundred per cent of the young reached fledgling age.

10. Daily counts of doves on 30 acres at Balboa Park for 11 weeks showed an ebb and flow of birds which may have been correlated with migration during August and September.

11. Seasonal abundance of doves in Nebraska as determined by roadside counts is compared with that reported by Siegler and Newman in Texas.

12. In Nebraska, the doves showed an increase each year. Dove flocking and movements were correlated with harvesting of grain and with land use. A greater number was found in irrigated valleys than in dry uplands.

13. A method of determining dove population indices by use of the number of nests counted in sample areas is discussed. Factors showing the ratio of active nests to the season's total nest production proved to be similar for Iowa and Nebraska.

14. Throughout the report, data from Iowa and Nebraska are compared and contrasted.

REFERENCES CITED

McCLURE, H. ELLIOTT
1942. Mourning Dove production in southwest Iowa. Auk, 59: 64–75.
1943. Ecology and management of the Mourning Dove, *Zenaidura macroura*, in Cass County, Iowa. Iowa Exp. Sta. Research Bull., 310.
1944. The effect of tree removal on a Mourning Dove population. Auk, 61: 561–564.

NICE, M. M., AND NICE, L. B.
1921. The roadside census. Wilson Bull., 33: 113–123.
1922. Further roadside censuses in Oklahoma. Wilson Bull., 34: 238–239.

SIEGLER, H. R., AND NEWMAN, C. C.
1944. The value and practicability of wildlife censuses along highways. Jour. Wildlife Managem., 8: 93–99.

Ord
Nebraska

ADRENAL AND THYROID WEIGHTS IN BIRDS

BY FRANK A. HARTMAN

MANY studies have been made of the weights of certain endocrines in mammals, but relatively little has been reported on birds, especially wild birds. Crile and Quiring have published weights from more than fifty species of birds, most of them being from one or two individuals.

Our report deals with 143 species in 38 families, many of which are represented by a sufficient number of individuals to make statistical comparison of the various data. These data have been obtained in the course of collecting material for histological study. Most of the water birds, and some land birds, were obtained on or near Grand Isle, Louisiana. The remainder came from two regions, Kezar Lake in Maine, and central Ohio.

Although the gonads were weighed, in addition to the adrenals and thyroids, they are not included, since we found no relation between their weight and that of the adrenal and thyroid.

METHODS

The larger birds were weighed on a platform balance, the medium-sized birds on an Ohaus balance with a capacity of 2400 g. and a sensitivity of 0.1 g., while the small birds were weighed on a Torsion balance of 120 g. capacity and 2 mgm. sensitivity. The glands were weighed on one of three balances: two Roller-Smith Torsions of 30 (0.005 mgm. sensitivity) and 600 mgm. (0.2 mgm. sensitivity) capacity respectively and the Torsion balance of 120 g. capacity. The most sensitive balance, which had the capacity for the tissue, was employed in each instance. Birds were dissected within two or three hours of killing, many within an hour. Small birds were dissected, in much of this work, in a small box saturated with water vapor. The size and construction of the box was much like that used in tissue culture work. The vapor was produced by distilling water from a flask heated by an alcohol lamp. Later, this was found unnecessary, since the organs could be kept moist by contact with surrounding tissue while being removed, and trimming away of extraneous tissue required so little time. Each gland was carefully freed from fat or other tissue with the aid of a binocular loupe. Since the time after removal from the body is most important in the small birds, rapid weighing was desirable. This was accomplished on a Roller-Smith Torsion balance in a few seconds.

In order to ascertain the weight loss from exposure to air, we made observations on the adrenals and thyroids of two English Sparrows. These glands were hung on the Roller-Smith balance exposed to the warm, dry atmosphere of the laboratory in the winter. Weighings made every minute showed that the loss was 2% per minute. Therefore, it is not necessary to weigh the glands in a vial when the Roller-Smith Torsion is employed.

Although the time of day does make a difference in the weight of the individual (Baldwin and Kendeigh), this factor is not so great as the variation from one individual to another and is, therefore, ignored in this report. Immature birds are not included since the adrenals and thyroids are relatively different in young and in mature specimens (Latimer). Only birds that appeared healthy and well nourished were included in our regular list. Individuals containing internal parasites were not included unless their adrenal and

thyroid weights were obviously not different from those of uninfected members of the same species.

RESULTS

Lists have been made of the mean values of the body, adrenal and thyroid weights and of the percentage body weights of adrenals and thyroids in all individuals which appeared to be in normal health. Tables have been made of those species that contained a considerable number of individuals. Where a family contained no species with a large number of individuals, one species representing that family was included in the tables. Species including six or more variates have been treated statistically. The tables show the number of individuals in each species as well as the standard deviations. Additional data on species in which the number of individuals is too small are listed in the text. In species with less than six variates, the lowest and highest variates are shown. All are arranged according to the Check-List of the American Ornithologists' Union.

INDIVIDUAL VARIATION

In a study of the adrenal and thyroid gland weights, the individual variation within a species must be considered first. Inspection shows that a great range of individual variation within a species is not unusual. In some species, this may be due to the great dispersion of one or two variates. The standard deviation shows the dispersion of the variates about the mean.

In the following 45 species, the highest value of the variate for both adrenals and thyroids was at least double their lowest value: Great Blue Heron, American Egret, Herring Gull, Forster's Tern, Flicker, Red-bellied Woodpecker, Hairy Woodpecker, Downy Woodpecker, Kingbird, Crested Flycatcher, Phoebe, Black-capped Chickadee, Carolina Chickadee, White-breasted Nuthatch, Red-breasted Nuthatch, Brown Creeper, Prairie Marsh Wren, Mockingbird, Catbird, Brown Thrasher, Robin, Veery, Bluebird, Golden-crowned Kinglet, Cedar Waxwing, Loggerhead Shrike, Red-eyed Vireo, Yellow Warbler, Magnolia Warbler, Myrtle Warbler, Black-throated Green Warbler, Pine Warbler, Northern Yellow-throat, Redstart, English Sparrow, Red-wing, Purple Grackle, Scarlet Tanager, Cardinal, Goldfinch, Junco, Tree Sparrow, Chipping Sparrow, Swamp Sparrow, Song Sparrow. In addition, this great range of variates was shown for the adrenal in the following 19 species: Louisiana Heron, Coot, Red-backed Sandpiper, Barn Owl, Ruby-throated Hummingbird, Belted Kingfisher, Yellow-bellied Sapsucker, Tree Swallow, Barn Swallow, Tufted Titmouse, House Wren, White-eyed Vireo, Blue-headed Vireo,

Prothonotary Warbler, Bay-breasted Warbler, Meadowlark, Seaside Sparrow, Field Sparrow and White-throated Sparrow. It was also shown in the thyroid for nine species: Red-shouldered Hawk, Bobwhite, Purple Martin, Blue Jay, Black and White Warbler, Blackburnian Warbler, Black-poll Warbler, Northern Water-Thrush and Red-eyed Towhee.

The least standard deviation for both adrenals and thyroids occurred in the Flicker, Hairy Woodpecker, Downy Woodpecker and Emden Goose. The least standard deviation for adrenals alone occurred in the Brown Pelican, and for thyroids alone in the Parula Warbler and Chestnut-sided Warbler.

It is interesting to note that a Snow Bunting, which had been caught in December and kept in a cage in the laboratory until May, possessed extremely small adrenals (0.0045% of body weight) and thyroids (0.0015% of body weight), as compared with the same glands (adrenals—0.0113%; thyroids—0.0061%, of body weight) from the same flock of buntings killed in December. This bird was a female in good condition at the time of sacrifice. There were two platyhelminthes in the abdominal cavity.

Some of the factors which might influence the endocrine weights have been considered. These are sex, sexual activity, season, and infection.

Sexual differences.—We have compared the adrenal and thyroid weights in males and females in all species where both are represented. There were differences between the sexes but these were no greater than the variation found within one or the other sex, except in those instances to be mentioned. In a few species we had a sufficiently large number of each sex to make a valid comparison. This was true for the Downy Woodpecker, Carolina Chickadee, Tufted Titmouse, White-breasted Nuthatch, Red-eyed Vireo, Myrtle Warbler, English Sparrow, Red-wing, and Cardinal. In none of these did there appear to be a significant difference between sexes in the adrenal. The difference in the thyroids between the male and female Red-wing looked significant but $t = 2.0$, which is not significant for the number of variates involved.[1] Therefore, a separation of the sexes has been made only in those forms where there appeared to be a difference.

All gonads were weighed but, since there was no relation between

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[1] $$t = \frac{M_1 - M_2}{\sqrt{(SEm_1)^2 + (SEm_2)^2}}$$

Values of t for various degrees of freedom are shown in Table 3, 8, Snedecor.

their weights and the variation of adrenal and thyroid weights, they have not been included in this study. Because of the observations of Riddle (1923) on the relation of adrenal hypertrophy to ovulation, we have noted especially the weight of the adrenals in the few birds which were collected with an egg in the oviduct ready to be laid. The values obtained were within the range of those from other individuals of the species. These observations were made on: a Woodcock, a hummingbird, a Flicker, a Black-capped Chickadee, a Robin, a Hermit Thrush, a Bluebird, and a Yellow-throat.

Seasonal differences.—Most of the collecting was done in the spring and fall, a small amount in the summer and little in the winter. In one species, the Myrtle Warbler, which was well represented in both spring and fall, there was no difference between either the adrenals or the thyroids at these seasons.

Infection.—The effect of infection on the adrenals and thyroids was observed in a gull and in some captive hawks. We have found few infected birds in the wild state, probably because they do not survive long in nature. A Herring Gull which appeared under-sized was collected on Lake Erie and found to have a large pus pocket in one shoulder. The adrenals and thyroids were twice normal size, being 0.030% and 0.016%, respectively, of the body weight. Two Cooper's Hawks and two Red-shouldered Hawks died of infections after several months in the laboratory. The adrenals of the Cooper's Hawks were twice normal size, being 0.022 and 0.0156% of the body weight, while the thyroids were somewhat smaller than normal, being 0.0036 and 0.0049% of the body weight. The adrenals of the Red-shouldered Hawks were two to three times normal size, being 0.032 and 0.048% of the body weight; while the thyroids were three to six times normal size, being 0.049 and 0.091% of the body weight.

Internal parasites.—We were interested in parasites as an influence on the size of the adrenal and thyroid. Each bird was examined for the presence of parasites. If they were found, the adrenal and thyroid weights were compared with the weights of these glands in birds of the same species, free from parasites. Frequently, there was no difference. The amount of infection varied widely. Undoubtedly we missed some of the parasites, but the following examples will illustrate the possible effect on the size of the glands.

All but one of the pelicans contained many nematodes, and sometimes cestodes, in the alimentary canal. The adrenals and thyroids of this one were within the range of the others. One cormorant contained nematodes in the stomach. Its adrenals were heavier,

while its thyroids were lighter, than other individuals of the species, being respectively 0.0268 and 0.0114% of the body weight. Nematodes were found in the abdomen of the sole Upland Plover which we collected. This bird had adrenals of 0.011% and thyroids of 0.0119% of the body weight. A Herring Gull with adrenals of normal size, 0.0162%, and thyroids above normal, 0.0128% of the body weight, contained nematodes. The intestine and abdominal cavity of a Barn Owl were infected with nematodes. Its adrenals (0.0125%) and thyroids (0.0062%) were little different from those of other Barn Owls. Two Barred Owls contained several tapeworms each. These are included in the tables, since they were the only specimens collected and they appeared normal. A Belted Kingfisher with many nematodes possessed adrenals and thyroids within the normal range. Two Flickers with several cestodes each contained adrenals of normal size, and thyroids which were low (0.0056 and 0.0044% of the body weight). A Downy Woodpecker containing a few cestodes had adrenals of normal size but thyroids which were smaller than usual (0.0065%). A House Wren with nematodes possessed normal-sized adrenals and thyroids. A Mockingbird with cestodes had very small adrenals (0.0036%) and undersized thyroids (0.006%). Two Robins with cestodes had abnormally small adrenals (0.0062 and 0.0072%) and subnormal thyroids (0.0088 and 0.0065%). A Bluebird with a cestode had glands of normal size. A Magnolia Warbler with cestodes in the abdominal cavity possessed glands of normal size. The only Yellow-breasted Chat which was collected contained adrenals of 0.013% and thyroids of 0.010% of the body weight. This bird contained one cestode. Five Red-wings infected with cestodes or nematodes, or both, possessed glands of normal size.

Thus one cannot predict from the amount of parasitic infection the influence it may have on adrenal and thyroid weights.

COMPARISON OF SPECIES

Are there significant differences between the adrenals and between the thyroids among the various species of the birds studied?

Inspection of the data shows differences in the percentage of body weight of the adrenals and thyroids among certain species. But, when there is considerable variation within the species, a comparison of the significance of differences (t) must be made. This has been done between species which appeared to be different.

Adrenals.—The adrenal of the Brown Pelican (Table 1), which appears the largest of any species studied, has been compared for

significance with the moderate-sized adrenal of the Emden Goose and one of the largest, that of the Prairie Marsh Wren. The value of t (Snedecor) for the pelican and goose is 7.5 and of the pelican and wren is 4.4. Therefore, the difference is certainly significant. The difference between the adrenals in the Marsh Wren and the Carolina Chickadee is probably significant, since $t = 2.4$. The difference between the adrenals in the Downy Woodpecker and Phoebe is probably not significant, since $t = 2.2$. The differences between the adrenals of the Mockingbird and Catbird and between the English Sparrow and Magnolia Warbler appear to be significant but are not, statistically, since $t = 1.0$ and 1.7, respectively, in each comparison.

The birds with the smallest adrenals are: the woodpeckers, Cooper's Hawk, Western Sandpiper, Barn Owl, Barred Owl, Blue Jay, Carolina Chickadee, Mockingbird, English Sparrow, and Red-wing.

Thyroids.—In the thyroids, a comparison has been made between certain species which appear to be different, but prove not to be significant statistically:

Flicker with Phoebe, $t = 1.6$

White-breasted Nuthatch with Red-breasted Nuthatch, $t = 1.5$

Golden-crowned Kinglet with Red-eyed Vireo, $t = 1.1$

Therefore, there is no significant difference between the thyroids of different species in all of the forms studied.

DISCUSSION

The great range in relative weights of the adrenals and thyroids among the individuals of many species of wild birds is noteworthy. Data on the adrenals in mammals, even domestic forms, also show considerable range. Brown, Pearce and Van Allen found that the adrenals were $0.02082 \pm 0.00795\%$ of the body weight in 644 normal male rabbits, while Sato obtained $0.014 \pm 0.0039\%$ for 77 female dogs and $0.0104 \pm 0.0031\%$ for 122 male dogs.

The least standard deviation for both adrenals and thyroids occurs in the Flicker, Hairy Woodpecker, Downy Woodpecker and Emden Goose. The least standard deviation for adrenals alone occurs in the Brown Pelican, and for thyroids alone in the Parula Warbler and the Chestnut-sided Warbler. Riddle (1927) has described "thyroid" races in Ring Doves, some characterized by large thyroids, others by small thyroids. It is probable that birds of the same strain, such as can be obtained in domesticated forms (*e.g.* the Emden Goose), show less variation in adrenal and thyroid weights than do wild birds.

The limited evidence at our disposal indicates that the difference

in adrenals and thyroids, between sexes, is no greater than that to be expected from individual variation. More data might show significant differences. According to Sauer and Latimer, the female fowl has approximately 30% more adrenal cortex, in proportion to the body weight, than the male.

Our data have not enabled us to investigate the effect of sexual activity very thoroughly, since many of the specimens were collected at seasons when this was at a minimum. We have seen no indications in either sex that a change in adrenal or thyroid size occurs at the time of great gonadal activity.

Riddle found that there was a mean size increase of 40% in the adrenals of pigeons and doves at the time of ovulation. In the few wild birds which we have collected at the time of ovulation, we were unable to detect a significant change in the size of the adrenal. This is easily understood since Riddle was using birds of one strain under controlled conditions, while we collected birds at random from their wild environment. Moreover, the variation within the species might be so great that a change produced by ovulation would be masked.

The limited amount of seasonal data which we have been able to collect in the same species indicates that the normal variation is greater than that due to possible seasonal change. The small adrenals and thyroids in the captive Snow Bunting might be explained in part as due to seasonal and temperature change. J. W. Blunt, Jr., stated that the adrenals of both sexes of the Herring Gull decline in size through July, then swing upward again in August. No data were given. Riddle (1927) has shown that the thyroids of pigeons are largest in the autumn and winter, decreasing in the spring and becoming smallest in the summer. Podhradsky also found that the weight of the thyroid in poultry varied with the season, weighing most in the fall and winter and least in the summer. But the relative weight curve of the bird ran parallel.

Riddle has shown that doves and pigeons with macroscopic evidence of disease (parasites, tubercles, enlarged spleen or enlarged liver) possess adrenals nearly twice as large as those of healthy birds. He found only 60 out of 241 birds free from evidence of disease. His birds were in the protected conditions of domestication and thus might survive longer if diseased than birds probably do in the wild state. Hawks which died from infection after being in our laboratory several months usually possessed enlarged adrenals but often small thyroids. A Herring Gull that was infected possessed both enlarged adrenals and thyroids. One might suspect that the large adrenal of

the Pelican was caused by parasitic infection, except that the adrenals of an individual free from parasites were just as large. Moreover, there was no congestion or other evidence of a reaction in the adrenals of the infected birds. We have also pointed out that many species that were infected did not appear to have abnormally large adrenals. In this connection, the observations of Brown *et al.* are pertinent. They found that, so long as rabbits remained in apparently good health, the values obtained for organ weights (including adrenals) of animals with lesions did not differ materially from those of animals that were entirely free from lesions.

Stresses are, undoubtedly, factors in the size of adrenals and thyroids. Thus the same species transferred from the wild state to a life of limited activity may show a reduction in the size of these organs, as did the Snow Bunting mentioned above. This has been shown in mammals for the adrenal. Hatai (2) found that the adrenals of the Norway rat were nearly twice as heavy as those of the albino rat. Moreover, Donaldson and King observed that captive Norway rats possessed lighter adrenals than the wild strain, but heavier than the albinos. Relative absence of stress may have been a factor in the small range encountered in the Emden Goose.

Before we leave the consideration of individual variation within species, we wish to point out discrepancies between some of the values obtained by Crile and Quiring (1940) and those obtained by us. They determined the adrenal and thyroid weights in a few of the same species included in our report. We have calculated their values in percentage of the body weight so that they might be compared with ours. The adrenal weights (0.030%) in their Brown Pelicans (two specimens) were less than ours. Some of their adrenal values for the Order Passeriformes were considerably higher than ours. In the following list we give first their values and then ours—Phoebe: 0.028–0.031%; 0.0146 ± 0.0044%. Barn Swallow: 0.032–0.040%; 0.013–0.026%. Robin: 0.030%; 0.0117 ± 0.0046%. Bluebird: 0.045–0.065%; 0.0063–0.0143%. English Sparrow: 0.027–0.030%; 0.0097 ± 0.0027%. Likewise, certain of their thyroid values were higher, *viz.*—Phoebe: 0.0143–0.033%; 0.0122 ± 0.0047%. Barn Swallow: 0.0279–0.0395%; 0.008–0.014%. Bluebird: 0.0176–0.032%; 0.0055–0.0123%. English Sparrow: 0.0178%; 0.0099 ± 0.0021%. Cowbird (female): 0.0212%; 0.0058–0.0073%. Song Sparrow: 0.069%; 0.0107 ± 0.0039%.

The discrepancies are so great that we are at a loss to explain them. No statement was made regarding the manner in which they prepared their tissues.

The great range found between species in our studies extends, for the adrenal, from the Brown Pelican of 0.040% body weight to the female Red-wing of 0.0077% body weight, or some of the woodpeckers which go as low as 0.0044% body weight. The thyroid range is from 0.021% body weight in cormorants to 0.004% body weight in the male Red-wing and in the male Boat-tailed Grackle. Individuals are even lower. Variations in the blood contained in the glands, due to congestion or to water content due to other factors, may occur but they could not account for the great differences observed. Therefore, these differences must be due in considerable measure to variations in the amount of tissue present.

If the assumption is justified that size of an endocrine gland in a healthy bird is an indication of its ability to produce hormones, there must be a great difference in this ability among different individuals and between different species. With reservations, that minor differences may be due to water or blood, the assumption seems valid.

The relative size of the adrenals and thyroids in different species bears no relation to their activity. Let us consider the adrenal first. Many birds with relatively much smaller adrenals are more active than the Brown Pelican. Birds which, like the Ruby-throated Hummingbird and the Purple Martin, are very active, have adrenals of moderate size. The relative size of the adrenals in different mammalian species also is not related to their activity. Likewise, there is no evident relationship between the habits and relative size of the thyroids. There is nothing unusual in the cormorant to distinguish it from many other birds with relatively much smaller thyroids. Size has nothing to do with the relative amount of iodine available in the region where the bird was taken, since there was no distinction between the relative weight of thyroids of birds of the same species taken in central Ohio and along the Gulf Coast (*e. g.* the Red-winged Blackbird).

Comparison of the relative adrenal size in birds with that in other vertebrates is interesting. Among the fishes, the weight of the interrenals, which are homologous to the adrenal cortex, has been determined (Hartman, Shelden and Green). In birds, this constitutes 65% of the adrenal (Miller and Riddle). The values for Elasmobranch interrenals range between 0.0092% body weight for some of the dogfishes and 0.0002% body weight for the blue shark. In the few reptiles studied, the range for the adrenals is from 0.05 to 0.01% of the body weight (Naccarati; Valle and Souza). In the

mammal, the guinea pig's adrenal is highest, attaining 0.05% (Bessessen and Carlson) to 0.07% (Kosaka) of the body weight; while that of the cow (Swett, Miller, *et al.;* Swett, Graves, *et al.*) is one of the lowest, ranging from 0.0034 to 0.0088%, according to our calculations. Thus we see that the relative weights of the adrenals in the birds studied do not go so high as those found in mammals but, otherwise, the range is similar.

CONCLUSIONS

The range of individual variation in the relative weights of the adrenals and thyroids may be so great in wild birds that few species show significant differences with each other. Basing our judgment on the habits of each species, we conclude from our study that the relative weights of the adrenals and thyroids of birds are unrelated to their activity.

SPECIES NOT SHOWN IN THE TABLES

(The values for body, adrenal and thyroid weights are given in this order: arithmetic mean and range.)

ARDEIDAE

2 *Casmerodius albus egretta* (American Egret): body, 975 g. (952–997); adrenals, 0.0179% (0.0138–0.0219); thyroids, 0.0050% (0.0029–0.0071). 1 *Leucophoyx thula* (Snowy Egret): body, 345 g.; adrenals, 0.0318%; thyroids, 0.0065%. 1 *Florida c. caerulea* (Little Blue Heron): body, 317 g.; adrenals, 0.0170%; thyroids, 0.010%. 1 *Butorides v. virescens* (Eastern Green Heron): body, 204 g.; adrenals, 0.0174%; thyroids, 0.0069%.

ANATIDAE

1 *Aythya collaris* (Ring-necked Duck): body, 665 g.; adrenals, 0.0158%; thyroids, 0.0071%. 1 *Lophodytes cucullatus* (Hooded Merganser): body, 585 g.; adrenals, 0.0207%; thyroids, 0.0085%. 1 *Mergus serrator* (Red-breasted Merganser): body, 917 g.; adrenals, 0.0137%; thyroids, 0.0076%.

ACCIPITRIDAE

1 *Buteo borealis* (Red-tailed Hawk): body, 1285 g.; adrenals, 0.0121%; thyroids, 0.003%. 2 *Buteo l. lineatus* (Northern Red-shouldered Hawk): body, 737.5 g. (700–775); adrenals, 0.0139 (0.0134–0.0143) %; thyroids, 0.011 (0.0073–0.0147) %. 1 *Aquila chrysaëtos canadensis* (Golden Eagle): body, 4410 g.; adrenals, 0.0073%; thyroids, 0.0054%.

RALLIDAE

1 *Rallus e. elegans* (King Rail): body, 333 g.; adrenals, 0.0138%; thyroids, 0.0045%.

CHARADRIIDAE

1 *Charadrius v. vociferus* (Killdeer): body, 79 g.; adrenals, 0.0109%; thyroids, 0.0074 %. 2 *Squatarola squatarola* (Black-bellied Plover): body, 198 g. (183–213); adrenals, 0.0127 (0.0093–0.0161) %; thyroids, 0.0068 (0.0063–0.0072) %.

SCOLOPACIDAE

1 *Philohela minor* (American Woodcock): body, 2539 g.; adrenals, 0.0088%; thyroids, 0.0059%. 1 *Bartramia longicauda* (Upland Plover): body, 97 g.; adrenals, 0.011%; thyroids, 0.012%. 2 *Tringa solitaria* (Solitary Sandpiper): body, 60.3 (54.5–66) g.; adrenals, 0.0152 (0.0145–0.0158) %; thyroids, 0.09%. 4 *Totanus melanoleucus* (Greater Yellow-legs): body, 178.9 (136–207) g.; adrenals, 0.0125 (0.009–0.0164) %; thyroids, 0.0072 (0.0063–0.0084). 4 *Erolia alpina sakhalina* (Red-backed Sandpiper); body, 51.6 (41–58) g.; adrenals, 0.0113 (0.0081–0.0178) %; thyroids, 0.0090 (0.0072–0.0123) %. 1 *Crocethia alba* (Sanderling): body, 63.7 (54.4–73) g.; adrenals, 0.0129 (0.0123–0.0134) %; thyroids, 0.0109 (0.0101–0.0116) %.

LARIDAE

1 *Larus delawarensis* (Ring-billed Gull): body, 947 g.; adrenals, 0.0412%; thyroids, 0.0333%. 1 *Larus atricilla* (Laughing Gull): body, 247 g.; adrenals, 0.0347%; thyroids, 0.0084%. 1 *Larus philadelphia* (Bonaparte's Gull): body, 221 g.; adrenals, 0.0191%; thyroids, 0.0109%. 3 *Sterna forsteri* (Forster's Tern): body, 123.7 (120–128) g.; adrenals, 0.0186 (0.0113–0.0279) %; thyroids, 0.0072 (0.0057–0.0084). 1 *Sterna h. hirundo* (Common Tern): body, 96 g.; adrenals, 0.0176%; thyroids, 0.010%. 2 *Sterna d. dougalli* (Roseate Tern): body, 110.5 (108–113) g.; adrenals, 0.0161 (0.0149–0.0172) %; thyroids, 0.0111 (0.0106–0.0115) %. 1 *Thalasseus m. maximus* (Royal Tern): body, 497 g.; adrenals, 0.0183%; thyroids, 0.008%. 3 *Hydroprogne caspia* (Caspian Tern): body, 548 (538–562) g.; adrenals, 0.0272 (0.0221–0.0316) %; thyroids, 0.0087 (0.0077–0.0092) %.

COLUMBIDAE

1 *Zenaidura macroura carolinensis* (Eastern Mourning Dove): body, 148 g.; adrenals, 0.0066%; thyroids, 0.0065%.

CUCULIDAE

1 *Coccyzus a. americanus* (Yellow-billed Cuckoo): body, 63 g.; adrenals, 0.0188%; thyroids, 0.0086%. 1 *Coccyzus erythrophthalmus* (Black-billed Cuckoo): body, 38 g.; adrenals, 0.0139%; thyroids, 0.0067%.

PICIDAE

1 *Ceophloeus pileatus abieticola* (Northern Pileated Woodpecker): body, 239 g.; adrenals, 0.0044%; thyroids, 0.0058%. 4 *Centurus carolinus* (Red-bellied Woodpecker): body, 75.1 (65–85.5) g.; adrenals, 0.0091 (0.0065–0.0134) %; thyroids, 0.0116 (0.0059–0.019) %. 1 *Melanerpes erythrocephalus* (Red-headed Woodpecker): body, 75.8 g.; adrenals, 0.0043%; thyroids, 0.0102%.

TYRANNIDAE

4 *Tyrannus tyrannus* (Eastern Kingbird): body, 43.4 (40.8–46.8) g.; adrenals, 0.0171 (0.0129–0.0218) %; thyroids, 0.0277 (0.0152–0.0549) %. 5 *Myiarchus crinitus boreus* (Northern Crested Flycatcher): body, 34.5 (30–39.2) g.; adrenals, 0.0123 (0.0072–0.0167) %; thyroids, 0.010 (0.0056–0.0153) %. 3 *Empidonax minimus* (Least Flycatcher): body, 9.4 (8.6–10) g.; adrenals, 0.0111 (0.008–0.0133) %; thyroids, 0.0151 (0.0105–0.0180) %. 2 *Myiochanes virens* (Eastern Wood Pewee): body, 14.5 (14.1–15.0) g.; adrenals, 0.0131 (0.0117–0.0145) %; thyroids, 0.0135 (0.0135–0.0135) %. 1 *Nuttallornis borealis* (Olive-sided Flycatcher): body, 14.8 g.; adrenals, 0.0084%; thyroids, 0.0114%.

HIRUNDINIDAE

3 *Iridoprocne bicolor* (Tree Swallow): body, 21.9 (21.0–22.7) g.; adrenals, 0.0106 (0.0066–0.0157) %; thyroids, 0.0105 (0.0081–0.0125) %. 1 *Riparia r. riparia* (Bank Swallow): body, 19 g.; adrenals, 0.0118%; thyroids, 0.0172%. 2 *Hirundo rustica erythrogaster* (Barn Swallow): body, 17.8 (16.7–18.9) g.; adrenals, 0.0194 (0.0132–0.0256) %; thyroids, 0.0112 (0.0082–0.0142) %. 1 *Petrochelidon pyrrhonota* (Cliff Swallow): body, 21.0 g.; adrenals, 0.0119%; thyroids, 0.0086%.

TROGLODYTIDAE

4 *Troglodytes aedon* (House Wren): body, 11.2 (10–12.9) g.; adrenals, 0.0111 (0.0083–0.0167) %; thyroids, 0.0094 (0.0068–0.0129) %. 3 *Troglodytes troglodytes hiemalis* (Eastern Winter Wren): body, 9.8 (8.9–12.0) g.; adrenals, 0.0199 (0.0175–0.0237) %; thyroids, 0.0130 (0.0114–0.0128) %. 1 *Thryothorus l. ludovicianus* (Carolina Wren): body, 23 g.; adrenals, 0.0093%; thyroids, 0.0109%.

MIMIDAE

3 *Toxostoma r. rufum* (Brown Thrasher): body, 73.4 (71.3–74.5) g.; adrenals, 0.0108 (0.0070–0.0166) %; thyroids, 0.0082 (0.0050–0.0099) %.

TURDIDAE

3 *Hylocichla guttata faxoni* (Eastern Hermit Thrush): body, 32 (30.4–35.7) g.; adrenals, 0.0141 (0.0116–0.0184) %; thyroids, 0.0080%. 1 *Hylocichla ustulata swainsoni* (Olive-backed Thrush): body, 31.7 g.; adrenals, 0.0114%; thyroids, 0.0110%.

SYLVIIDAE

1 *Polioptila c. caerulea* (Blue-gray Gnatcatcher): body, 5.9 g.; adrenals, 0.0178%; thyroids, 0.0083%. 3 *Regulus calendula* (Ruby-crowned Kinglet): body, 7.2 (6.8–7.9) g.; adrenals, 0.0101 (0.0079–0.0129) %; thyroids, 0.0074 (0.0074–0.0114) %.

STURNIDAE

2 *Sturnus v. vulgaris* (Starling): body, 78.7 (75–82.4) g.; adrenals, 0.0134 (0.0150–0.0177) %; thyroids, 0.0079 (0.0077–0.0081) %.

VIREONIDAE

2 *Vireo g. griseus* (White-eyed Vireo): body, 11.4 (10.4–12.4) g.; adrenals, 0.0193 (0.0149–0.0236) %; thyroids 0.0147%. 1 *Vireo flavifrons* (Yellow-throated Vireo): body, 17.5 g.; adrenals, 0.0106%; thyroids, 0.0171%. 5 *Vireo s. solitarius* (Blue-headed Vireo): body, 17.0 (15.7–18.3) g.; adrenals, 0.0141 (0.0102–0.0194) %; thyroids, 0.0097 (0.0078–0.0107) %. 1 *Vireo philadelphicus* (Philadelphia Vireo): body, 11.7 g.; adrenals, 0.0118%; thyroids, 0.0099%.

COMPSOTHLYPIDAE

4 *Protonotaria citrea* (Prothonotary Warbler): body, 13.3 (11.3–14.5) g.; adrenals, 0.0129 (0.0086–0.0206) %; thyroids, 0.0108 (0.0083–0.0135) %. 1 *Vermivora peregrina* (Tennessee Warbler): body, 13.0 g.; adrenals, 0.0149%; thyroids, 0.0059%. 1 *Vermivora r. ruficapilla* (Nashville Warbler): body, 8.3 g.; adrenals, 0.0157%; thyroids, 0.0060%. 2 *Dendroica c. caerulescens* (Black-throated Blue Warbler): body, 9 g.; adrenals, 0.0184 (0.0175–0.0192) %; thyroids, 0.0079 (0.0066–0.0092) %. 5 *D. fusca* (Blackburnian Warbler): body, 9.5 (8.5–10.9) g.; adrenals, 0.0145 (0.0156–

0.0194) %; thyroids, 0.0102 (0.0065–0.0180) %. 5 *D. castanea* (Bay-breasted Warbler): body, 14.6 (14–15.3) g.; adrenals, 0.0094 (0.0075–0.0143) %; thyroids, 0.0101 (0.0071–0.0130) %. 5 *D. striata* (Black-poll Warbler): body, 8.5 (6.5–10) g.; adrenals, 0.020 (0.0166–0.022) %; thyroids, 0.0127 (0.0079–0.0211) %. 3 *D. p. pinus* (Pine Warbler): body, 10.8 (7.7–13) g.; adrenals, 0.0194 (0.0115–0.0250) %; thyroids, 0.0120 (0.0073–0.0187) %. 1 *Seiurus aurocapillus* (Oven-bird): body, 17.5 g.; adrenals, 0.0183%; thyroids, 0.0091%. 4 *Seiurus n. noveboracensis* (Northern Water-Thrush): body, 17.7 (14.5–21.4) g.; adrenals, 0.0197 (0.0157–0.0266) %; thyroids, 0.0109 (0.0059–0.0213) %. 1 *Oporornis agilis* (Connecticut Warbler): body, 19.4 g.; adrenals, 0.0078%; thyroids, 0.0131%. 1 *Icteria virens* (Yellow-breasted Chat): body, 25.1 g.; adrenals, 0.0103%; thyroids, 0.0101%. 5 *Wilsonia canadensis* (Canada Warbler): body, 9.6 (9.3–10.0); adrenals, 0.0141 (0.0105–0.0172); thyroids, 0.0085 (0.0071–0.0097) %.

ICTERIDAE

1 *Dolichonyx oryzivorus* (Bobolink): body, 35.1 g.; adrenals, 0.0118%; thyroids, 0.0124%. *Sturnella magna* (Meadowlark) 5 males: body, 112.1 (98–112) g.; adrenals, 0.0066 (0.0034–0.0079) %; thyroids, 0.0058 (0.0048–0.0077) %; 4 females: body, 83.9 (78–95.3) g.; adrenals, 0.0106 (0.0069–0.0151) %; thyroids, 0.0065 (0.0055–0.0083) %. 1 *Icterus galbula* (Baltimore Oriole): body, 35.3 g.; adrenals, 0.0135%; thyroids, 0.0105%. 2 *Euphagus carolinus* (Rusty Blackbird): body, 60.5 (55–66) g.; adrenals, 0.0095 (0.0069–0.0121) %; thyroids, 0.0064 (0.0049–0.0079) %. *Quiscalus q. quiscula* (Purple Grackle) 4 males: body, 121.5 (118.4–126.3) g.; adrenals, 0.0104 (0.0064–0.0192) %; thyroids, 0.0117 (0.0041–0.0155) %; 3 females: body, 100.0 (95.4–105.6) g.; adrenals, 0.0077 (0.0058–0.0107) %; thyroids, 0.0082 (0.0037–0.0153) %. *Molothrus ater* (Cowbird) 4 males: body, 51.5 (48.0–54.9) g.; adrenals, 0.0093 (0.0079–0.0117) %; thyroids, 0.0061 (0.0046–0.0081) %; 4 females: body, 38.9 (35.2–42.5) g.; adrenals, 0.0121 (0.0075–0.0146) %; thyroids, 0.0067 (0.0058–0.0073) %.

FRINGILLIDAE

3 *Hedymeles ludovicianus* (Rose-breasted Grosbeak): body, 42.7 (41–44.3) g.; adrenals, 0.0129 (0.0113–0.0146) %; thyroids, 0.0128%. 2 *Carpodacus purpureus* (Purple Finch): body, 20.7 (18.5–23) g.; adrenals, 0.0279 (0.0191–0.0368) %; thyroids, 0.0140 (0.0130–0.0149) %. 4 *Ammospiza maritima fisheri* (Louisiana Seaside Sparrow): body, 17.8 (15.5–20) g.; adrenals, 0.0064 (0.0036–0.0076) %; thyroids, 0.0068 (0.0049–0.0083) %. 3 *Spizella pusilla* (Field Sparrow): body, 13.8 (12.2–14.8) g.; adrenals, 0.0104 (0.0091–0.0121) %; thyroids, 0.0084 (0.0057–0.0112) %. 1 *Passerella iliaca* (Fox Sparrow): body, 43.6 g.; adrenals, 0.0021%; thyroids, 0.0063%. 1 *Melospiza lincolnii* (Lincoln's Sparrow): body, 16 g.; adrenals, 0.0150%; thyroids, 0.0150%. 2 *Plectrophenax nivalis* (Snow Bunting): body, 36.9 (34.7–39) g.; adrenals, 0.0113 (0.0112–0.0115) %; thyroids, 0.0061 (0.0059–0.0063) %.

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TABLE I

ARITHMETIC MEAN BODY WEIGHTS, ADRENAL WEIGHTS AND THYROID WEIGHTS WITH STANDARD DEVIATIONS
(Arranged according to the Check-List of the American Ornithologists' Union)

Family and species	*Number*	*Body weight arithmetic mean (grams)*	*Adrenal*		*Thyroid*	
			Arithmetic mean (grams)	*Weight per cent body wt.*	*Arithmetic mean (grams)*	*Weight per cent body wt.*
COLYMBIDAE						
Podilymbus podiceps (Pied-billed Grebe)	1	312	0.0600	0.0192	0.0283	0.0091
PELECANIDAE						
Pelecanus occidentalis (Brown Pelican)	6	3422±344	1.387	0.0405±0.0056	0.257	0.0075±0.0013
PHALACROCORACIDAE						
Phalacrocorax auritus (Double-crested Cormorant)	2	1858 (1787–1929)*	0.337	0.0182 (0.0177–0.0187)*	0.389	0.0211 (0.0176–0.0246)*
ARDEIDAE						
Ardea herodias (Great Blue Heron)	5	1951 (1476–2269)	0.234	0.0120 (0.0067–0.0237)	0.116	0.0061 (0.0044–0.0081)
Hydranassa tricolor ruficollis (Louisiana Heron)	3	467 (418–513)	0.0654	0.014 (0.0096–0.022)	0.0266	0.0057 (0.0055–0.0060)
ANATIDAE						
Anser anser (Emden Goose)	10	5707±878	0.6286	0.0114±0.0016	0.5185	0.0089±0.0018
ACCIPITRIDAE						
Accipiter cooperii (Cooper's Hawk)	3	569 (543–593)	0.0496	0.0084 (0.0081–0.0084)	0.0336	0.0059 (0.0052–0.0068)

* Range.

TABLE I—*Continued*

FALCONIDAE *Falco sparverius* (Sparrow Hawk)	2	104.5 (104–105)	0.0166	0.0159 (0.0153–0.0165)	0.0115	0.0110 (0.0085–0.0135)
PHASIANIDAE *Colinus virginianus* (Bobwhite)	6	194.6±20.8	0.02145	0.0110±0.0019	0.01775	0.0093±0.0042
RALLIDAE *Fulica americana* (Coot)	4	505 (481–543)	0.0751	0.015 (0.0092–0.0229)	0.045	0.0089 (0.0073–0.0106)
SCOLOPACIDAE *Ereunetes mauri* (Western Sandpiper)	5	25.2 (22.5–26.7)	0.0025	0.0106 (0.0074–0.0129	0.0033	0.0131 (0.0111–0.0157)
LARIDAE *Larus argentatus smithsonianus* (Herring Gull)	8	1012.1±194	0.155	0.0153±0.0062	0.085	0.0084±0.0024
TYTONIDAE *Tyto alba pratincola* (Barn Owl)	2	524.5	0.0456	0.0087 (0.0053–0.0121)	0.0409	0.0078 (0.0065–0.0090)
STRIGIDAE *Strix varia* (Barred Owl)	2	706.5	0.0672	0.0094 (0.0092–0.0095)	0.0389	0.0055 (0.0052–0.0059)
TROCHILIDAE *Archilochus colubris* (Ruby-throated Hummingbird)	4	3.36 (3.0–3.63)	0.000427	0.0127 (0.0095–0.0193)	0.000467	0.0139 (0.0132–0.0146)
ALCEDINIDAE *Megaceryle alcyon* (Belted Kingfisher)	5	150.6 (137–166)	0.0191	0.0127 (0.0060–0.0188)	0.0139	0.0092 (0.0081–0.0107)

TABLE 1—*Continued*

Family and species	*Number*	*Body weight arithmetic mean (grams)*	*Adrenal*		*Thyroid*	
			Arithmetic mean (grams)	*Weight per cent body wt.*	*Arithmetic mean (grams)*	*Weight per cent body wt.*
PICIDAE						
Colaptes auratus luteus (Northern Flicker)	16	134.3±8.9	0.0128	0.0095±0.0003	0.00873	0.0065±0.0003
Sphyrapicus varius (Yellow-bellied Sapsucker)	8	46.8±4.2	0.00435	0.0093±0.0024	0.00352	0.0076±0.0019
Dryobates villosus (Hairy Woodpecker)	9	67.6±7.6	0.00561	0.0083±0.0003	0.00426	0.0063±0.0003
Dryobates pubescens medianus (Northern Downy Woodpecker)	30	26.9±1.9	0.00229	0.0085±0.0003	0.00191	0.0071±0.0003
TYRANNIDAE						
Sayornis phoebe (Eastern Phoebe)	10	19.4±1.4	0.00283	0.0146±0.0044	0.00237	0.0122±0.0047
HIRUNDINIDAE						
Progne subis (Purple Martin)	7	47.8±3.4	0.00636	0.0133±0.0021	0.00410	0.0086±0.0033
CORVIDAE						
Cyanocitta cristata (Blue Jay)	18	88.9±5.47	0.00854	0.0095±0.0025	0.00693	0.00779±0.0026
PARIDAE						
Parus atricapillus (Black-capped Chickadee)	18	11.5±0.87	0.00139	0.0121±0.0043	0.00120	0.0104±0.0036
Parus c. carolinensis (Carolina Chickadee)	21	10.0±0.8	0.00100	0.0100±0.0036	0.00125	0.0125±0.0049
Parus bicolor (Tufted Titmouse)	14	21.4±1.5	0.00241	0.01126±0.0047	0.00211	0.00987±0.0036
SITTIDAE						
Sitta c. carolinensis (White-breasted Nuthatch)	14	21.0±1.5	0.00265	0.0126±0.0047	0.00194	0.00924±0.0046
Sitta canadensis (Red-breasted Nuthatch)	13	10.2±1.0	0.00166	0.0163±0.0074	0.00166	0.0163±0.0053

SITTIDAE						
Sitta c. carolinensis (White-breasted Nuthatch)	14	21.0±1.5	0.00265	0.0126±0.0047	0.00194	0.00924±0.0046
Sitta canadensis (Red-breasted Nuthatch)	13	10.2±1.0	0.00166	0.0163±0.0074	0.00166	0.0163±0.0053

TABLE 1—*Continued*

CERTHIIDAE						
Certhia familiaris americana (Brown Creeper)	9	8.8±0.47	0.00125	0.0142±0.0061	0.00092	0.0105±0.0038
TROGLODYTIDAE						
Telmatodytes palustris dissaëptus (Prairie Marsh Wren)	7	12.5±1.1	0.00225	0.0184±0.0051	0.00124	0.0099±0.0031
MIMIDAE						
Mimus polyglottos (Mockingbird)	10	54.5±4.1	0.0054	0.0099±0.0041	0.00463	0.0085±0.0024
Dumetella carolinensis (Catbird)	10	37.9±3.8	0.00576	0.0152±0.0084	0.00455	0.0120±0.0038
TURDIDAE						
Turdus migratorius (Robin)	14	79.7±9.1	0.00932	0.0117±0.0046	0.0082	0.0103±0.0033
Hylocichla fuscescens (Veery)	10	30.0±4.7	0.00453	0.0151±0.0047	0.00378	0.0126±0.0029
Sialia sialis (Bluebird)	6	32.06±2.66	0.00342	0.0106±0.0026	0.00316	0.0098±0.0024
SYLVIIDAE						
Regulus satrapa (Golden-crowned Kinglet)	14	6.3±0.62	0.00085	0.0135±0.0045	0.000552	0.0088±0.0044
BOMBYCILLIDAE						
Bombycilla cedrorum (Cedar Waxwing)	9	33.8±3.0	0.00524	0.0155±0.0040	0.00341	0.0101±0.0041
LANIIDAE						
Lanius ludovicianus (Loggerhead Shrike)	7	48.5±1.27	0.00582	0.0120±0.0049	0.0049	0.0101±0.0044
VIREONIDAE						
Vireo olivaceus (Red-eyed Vireo)	15	17.9±2.9	0.00293	0.0164±0.0057	0.00247	0.0138±0.0050

TABLE 1—*Continued*

Family and species	*Number*	*Body weight arithmetic mean (grams)*	*Adrenal*		*Thyroid*	
			Arithmetic mean (grams)	*Weight per cent body wt.*	*Arithmetic mean (grams)*	*Weight per cent body wt.*
COMPSOTHLYPIDAE						
Mniotilta varia (Black and White Warbler)	12	10.3±0.56	0.00141	0.0137±0.0025	0.000834	0.0081±0.0022
Compsothlypis americana pusilla (Parula Warbler)	9	7.6±0.83	0.00115	0.0151±0.0034	0.00078	0.0103±0.0022
Dendroica petechia (Yellow Warbler)	6	10.3±0.80	0.00171	0.0155±0.0046	0.00098	0.0096±0.0037
Dendroica magnolia (Magnolia Warbler)	17	8.3±0.61	0.00129	0.0156±0.0044	0.00110	0.0133±0.0054
Dendroica coronata (Myrtle Warbler)	25	12.6±1.10	0.00157	0.0125±0.0049	0.00150	0.0119±0.0041
Dendroica virens (Black-throated Green Warbler)	19	9.0±0.50	0.00151	0.0168±0.0061	0.00127	0.0141±0.0042
Dendroica pensylvanica (Chestnut-sided Warbler)	11	9.7±0.44	0.00146	0.0151±0.0034	0.00093	0.0096±0.0017
Geothlypis trichas brachidactyla (Northern Yellow-throat)	15	10.1±0.83	0.00155	0.0153±0.0058	0.00103	0.0102±0.0036
Setophaga ruticilla (Redstart)	9	8.3±0.65	0.00122	0.0147±0.0058	0.00098	0.0118±0.0050
PLOCEIDAE						
Passer domesticus (English Sparrow)	28	25.1±2.3	0.00243	0.0097±0.0027	0.00249	0.0099±0.0021
ICTERIDAE						
Agelaius phoeniceus littoralis (Red-winged Blackbird)						
male	15	54.0±3.4	0.00485	0.0089±0.0034	0.00243	0.0045±0.0020
female	8	34.0±1.48	0.0026	0.0077±0.0020	0.0026	0.0077±0.0012
Cassidix mexicanus major (Boat-tailed Grackle)	7	161.3±13.0	0.0189	0.0117±0.0030	0.0068	0.0042±0.0010

Cassidix mexicanus major (Boat-tailed Grackle)	7	161.3±13.0	0.0189	0.0117±0.0030	0.0068	0.0042±0.0010

TABLE 1—*Continued*

THRAUPIDAE						
Piranga erythromelas (Scarlet Tanager)	8	28.5±1.1	0.00359	0.0126±0.0043	0.00273	0.0096±0.0026
FRINGILLIDAE						
Richmondena cardinalis (Cardinal)	21	44.6±3.1	0.00482	0.0108±0.0029	0.00446	0.0100±0.0034
Spinus tristis (Goldfinch)	6	13.5±0.95	0.00148	0.0097±0.0038	0.00193	0.0145±0.0032
Pipilo erythrophthalmus (Red-eyed Towhee)	8	41.5±2.9	0.00442	0.0108±0.0027	0.00317	0.0077±0.0021
Junco hyemalis (Slate-colored Junco)	6	20.9±1.41	0.00253	0.0115±0.0016	0.00187	0.0104±0.0034
Spizella arborea (Tree Sparrow)	7	17.6±0.96	0.00142	0.0081±0.0030	0.00191	0.00142±0.0045
Spizella passerina (Chipping Sparrow)	7	12.6±1.28	0.00157	0.0120±0.0043	0.00113	0.0086±0.0055
Zonotrichia albicollis (White-throated Sparrow)	10	27.9±3.26	0.00315	0.0113±0.0053	0.00335	0.0120±0.0026
Melospiza georgiana (Swamp Sparrow)	17	18.5±2.49	0.00235	0.0127±0.0050	0.00174	0.0094±0.0029
Melospiza melodia (Song Sparrow)	15	21.8±2.67	0.00283	0.0130±0.0049	0.00224	0.0107±0.0039

SUMMARY

1. Body weights, adrenal weights and thyroid weights were obtained for 143 species of birds distributed among 38 families, in order to compare the relative size of the adrenal and thyroid within each species, as well as between species.

2. The range of relative weights in adrenal and thyroid was great in 45 species, in adrenal alone for 19 species, and for thyroid alone in nine species. The standard deviation indicated that the spread of values was large in many species. The least standard deviation for both adrenals and thyroids occurred in the Flicker, Hairy Woodpecker, Downy Woodpecker, and Emden Goose. The least standard deviation for adrenals alone occurred in the Brown Pelican, and for thyroids alone in the Parula and Chestnut-sided Warblers.

3. A Snow Bunting, caught in December and kept in a cage in the laboratory until May, possessed extremely small adrenals and thyroids as compared with these glands from the same flock of buntings killed in December.

4. Among the few species in which the number of individuals was large enough for a valid comparison, none showed a significant difference in the adrenals and thyroids between sexes.

5. The relative weight of adrenals in birds collected with an egg in the oviduct was no greater than that found in other individuals of the species not ovulating.

6. In the one species well represented in both spring and fall, the Myrtle Warbler, there was no difference between either the adrenals or the thyroids at these seasons.

7. In the few infected birds which we collected the adrenals were often enlarged while the thyroids were sometimes enlarged.

8. Parasitic infection influenced the weights of the adrenals and thyroids in some instances but not in others.

9. Standard errors were calculated wherever the numbers were sufficient and a comparison of the significance of differences was made between certain species which suggested a difference on inspection.

10. The adrenal of the Brown Pelican was relatively the largest of any species studied. The Woodpeckers were among those birds which have the smallest adrenals. Others that might have equally small adrenals were: Cooper's Hawk, Western Sandpiper, Barn Owl, Barred Owl, Blue Jay, Carolina Chickadee, Mockingbird, English Sparrow, and Red-wing. The adrenals of the Marsh Wren are probably significantly larger than those of the Carolina Chickadee.

11. There was no significant difference between thyroids among the different species.

12. The relative size of the adrenals and thyroids in different species bears no relation to their activity.

13. Comparison of the relative weights of the adrenals in birds with those in mammals shows a similarity in range among individuals of a species and among different species of the class.

LITERATURE CITED

BALDWIN, S. P. AND KENDEIGH, S. C.
1938. Variations in the weight of birds. The Auk, 55: 416–467.

BESSESSEN, A. N. AND CARLSON, H. A.
1923. Post-natal growth in weight of the body and of various organs in the guinea pig. Amer. Jour. Anat., 31: 483–521.

BLUNT, J. W., JR.
Gland fluctuations through the seasons. Bowdoin College Bull. No. 7: 36–37.

BROWN, W. H., PEARCE, L., AND VAN ALLEN, C. M.
1925. Effects of obscure lesions on organ weights of apparently normal rabbits. Jour. Exper. Med., 42: 163–178.
1926. Effect of spontaneous disease on organ weights of rabbits. Jour. Exper. Med., 43: 241–262.
1926. Organ weights of normal rabbits. Jour. Exper. Med., 43: 733–741.

CRILE, GEORGE, AND QUIRING, D. P.
1940. A record of the body weight and certain organ and gland weights of 3690 animals. Ohio Jour. Sci., 40: 219–259.

DONALDSON, H. H., AND KING, H. D.
1929. Life processes and size of the body and organs of the gray Norway rat during ten generations in captivity. Amer. Anat. Mem., No. 14.

HARTMAN, F. A., SHELDEN, F. F., AND GREEN, E. L.
1943. Weights of interrenal glands of elasmobranchs. Anat. Rec., 87: 371–378.

HATAI, S.
1914. On the weight of some of the ductless glands of the Norway and of the albino rat according to sex and variety. Anat. Rec., 8: 511.

KOSAKA, Y.
1932. Quantitative determination of the adrenal cortex and medulla in the growing guinea pig. Folia Anat. Japonica, 10: 601–620.

LATIMER, H. B.
1925. Postnatal growth of the body, systems and organs of the single-comb white leghorn chicken. Anat. Rec., 31: 233–253.

MILLER, R. A., AND RIDDLE, O.
1942. The cytology of the adrenal cortex of normal pigeons and in experimentally induced atrophy and hypertrophy. Amer. Jour. Anat., 71: 311–341.

NACCARATI, S.
1922. On the relation between the weight of the internal secretory glands and the body weight and brain weight. Anat. Rec., 24: 255–260.

PODHRADSKY, J.
1933. The thyroid gland and the laying period in poultry. 1. Changes in the weight of the thyroid. Vestnik Ceskoslov. Akad. Zem., 9: 148–156.

RIDDLE, O.
1923. Suprarenal hypertrophy coincident with ovulation. Amer. Jour. Physiol., 66: 322–339.
1927. Studies on thyroids. Endocrinology, 11: 161–172.
SATO, H.
1930. Relative weights of the organs of dogs. Tohoku Jour. Exper. Med., 16: 487–493.
SAUER, F. C., AND LATIMER, H. B.
1930. Sex differences in the proportion of the cortex and the medulla in the chicken suprarenal. Anat. Rec., 50: 289–297.
SNEDECOR, G. W.
1940. Statistical methods. Ames, Iowa. (Iowa State College Press.)
SWETT, W. W., GRAVES, R. R., AND MILLER, F. W.
1928. Comparisons of conformation, anatomy and skeletal structure of a highly specialized dairy cow and a highly specialized beef cow. Jour. Agric. Research, 37: 685–717.
SWETT, W. W., MILLER, F. W., GRAVES, R. R., BLACK, W. H., AND CREECH, G. R.
1937. Comparative conformation, anatomy and udder characteristics of cow of certain beef and dairy breeds. Jour. Agric. Research, 55: 239–287.
VALLE, J. R., AND SOUZA, P. R.
1942. Observations on the endocrine system of ophidians. Revista Brasileira de Biologia, 2: 81–88.

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THE NUMBER OF SPECIES OF BIRDS

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"How many species of birds are known?" is a question the bird taxonomist is asked very frequently. The answer, up to now, has had to be a guess. It is for this reason that I decided to count the species, family by family, on the basis of the best available information.

In the tenth edition of the 'Systema Naturae' (1758), the first work in which the species concept is consistently applied, Linnaeus enumerates 564 species of birds, known to him from all parts of the world. In the subsequent 150 years a number of additional counts were published, each one to be quickly superseded by a newer one. The last of these counts is contained in the fifth and final volume of Sharpe's 'Handlist' (1909). The number admitted by Sharpe was 2,810 genera and 18,937 species. This figure, however, includes not only the fossil species, but also treats all subspecies as full species. It is, therefore, obvious that the actual number of species of birds must be considerably below Sharpe's figure, even though about 400 additional good species have been described since 1909. In 1935 I

made a careful estimate and arrived at the figure 8,500 (Mayr, 1935). Other recent authors have made estimates which vary from 10,000 (Stresemann) to 16,000. It is obviously desirable to replace these rough estimates by an accurate count.

Most helpful in this count were the recent standard works on bird taxonomy, such as Peters's 'Check-list of the Birds of the World' and Hellmayr's 'Catalogue of Birds of the Americas.' However, these works were not followed blindly, and modifications were made wherever more recent revisions were available or where an examination of the material led me to different conclusions. In most cases these changes consisted in reducing to the status of subspecies allopatric forms regarded as full species by the earlier authors. As far as the Old World families are concerned, the subsequently listed counts are based directly on the collections of the American Museum which were rearranged during the past ten years by Dr. J. P. Chapin and myself with the help of Messrs. J. Delacour, H. Birckhead, D. Amadon, M. Moynihan, and C. Vaurie. This involved the complete revision of many families, the results of which have been published only in part. Mr. C. K. Nichols had the kindness to count for me the species in the following American families: Dendrocolaptidae, Furnariidae, Formicariidae, Conopophagidae, Rhinocryptidae, Cotingidae, Pipridae, Tyrannidae, Oxyruncidae, and Phytotomidae.

The principal difficulty one has to face during a count of the species of birds in the world is to decide, in the case of the many borderline forms, whether to consider them species or subspecies. I was guided in my decisions by the modern biological species concept which does not require morphological intergradation between geographical races, but only the probability of interbreeding. To list a doubtful form as a species, if it is really only a subspecies, is considered by me just as serious an error as to list a form as a subspecies, which really deserves species rank. If anything, I have erred on the conservative side. The final count will probably be lower than mine by about 100 species.

The sequence of families follows Wetmore (1940) in the non-Passeres, but follows in the Passeres a system which was developed by the members of the staff of the Department of Birds at the American Museum (R. C. Murphy, J. T. Zimmer, E. Mayr, J. P. Chapin, and J. Delacour) for use in the new synoptic exhibits of the Museum. This system follows closely the generally adopted classifications of Sharpe's 'Handlist' and other standard works. It places the primitive babbler-thrush group near the beginning and the oriole-corvid-

TABLE 1

NUMBER OF SPECIES OF BIRDS BY FAMILIES

1 STRUTHIONIDAE, Ostriches
2 RHEIDAE, Rheas
3 CASUARIIDAE, Cassowaries
2 DROMICEIDAE, Emus
3 APTERYGIDAE, Kiwis
32 TINAMIDAE, Tinamous
17 SPHENISCIDAE, Penguins
3 GAVIIDAE, Loons
20 COLYMBIDAE, Grebes
14 DIOMEDEIDAE, Albatrosses
56 PROCELLARIIDAE, Shearwaters, Fulmars
18 HYDROBATIDAE, Storm Petrels
5 PELECANOIDIDAE, Diving Petrels
3 PHAETHONTIDAE, Tropic-birds
6 PELECANIDAE, Pelicans
9 SULIDAE, Boobies, Gannets
30 PHALACROCORACIDAE, Cormorants
1 ANHINGIDAE, Snake-birds
5 FREGATIDAE, Frigate-birds
59 ARDEIDAE, Herons, Bitterns
1 BALAENICIPITIDAE, Whale-headed Storks
1 SCOPIDAE, Hammerheads
16 CICONIIDAE, Storks, Jabirus
28 THRESKIORNITHIDAE, Ibises, Spoonbills
6 PHOENICOPTERIDAE, Flamingos
3 ANHIMIDAE, Screamers
145 ANATIDAE, Ducks, Geese, Swans
6 CATHARTIDAE, New World Vultures
1 SAGITTARIIDAE, Secretary-birds
205 ACCIPITRIDAE, Hawks, Old World Vultures, Harriers
1 PANDIONIDAE, Ospreys
58 FALCONIDAE, Falcons, Caracaras
10 MEGAPODIIDAE, Megapodes
38 CRACIDAE, Curassows, Guans, Chachalacas
18 TETRAONIDAE, Grouse
165 PHASIANIDAE, Quails, Pheasants, Peacocks
7 NUMIDIDAE, Guinea-fowl
2 MELEAGRIDIDAE, Turkeys
1 OPISTHOCOMIDAE, Hoatzins
3 MESOENATIDAE, Roatelos, Monias
15 TURNICIDAE, Bustard-quails
1 PEDIONOMIDAE, Collared Hemipodes
14 GRUIDAE, Cranes
1 ARAMIDAE, Limpkins
3 PSOPHIIDAE, Trumpeters
132 RALLIDAE, Rails, Coots, Gallinules
3 HELIORNITHIDAE, Sun-grebes
1 RHYNOCHETIDAE, Kagus
1 EURYPYGIDAE, Sun-bitterns
2 CARIAMIDAE, Cariamas
23 OTIDIDAE, Bustards
7 JACANIDAE, Jacanas
2 ROSTRATULIDAE, Painted Snipe
6 HAEMATOPODIDAE, Oyster-catchers
63 CHARADRIIDAE, Plovers, Turnstones, Surf-birds
77 SCOLOPACIDAE, Snipe, Woodcock, Sandpipers
7 RECURVIROSTRIDAE, Avocets, Stilts
3 PHALAROPODIDAE, Phalaropes
1 DROMADIDAE, Crab-plovers
9 BURHINIDAE, Thick-knees
16 GLAREOLIDAE, Pratincoles, Coursers
4 THINOCORIDAE, Seed-snipe
2 CHIONIDAE, Sheath-bills
4 STERCORARIIDAE, Skuas, Jaegers
82 LARIDAE, Gulls, Terns
3 RYNCHOPIDAE, Skimmers
22 ALCIDAE, Auks, Auklets, Murres
16 PTEROCLIDAE, Sand-grouse
3 RAPHIDAE, Dodos, Solitaires
289 COLUMBIDAE, Pigeons, Doves
315 PSITTACIDAE, Lories, Parrots, Macaws
19 MUSOPHAGIDAE, Plantain-eaters
127 CUCULIDAE, Cuckoos, Roadrunners, Anis
11 TYTONIDAE, Barn-owls
123 STRIGIDAE, Owls
1 STEATORNITHIDAE, Oil-birds
12 PODARGIDAE, Frogmouths
5 NYCTIBIIDAE, Potoos
7 AEGOTHELIDAE, Owlet-frogmouths
67 CAPRIMULGIDAE, Goatsuckers
76 MICROPODIDAE, Swifts
3 HEMIPROCNIDAE, Crested Swifts
319 TROCHILIDAE, Hummingbirds
6 COLIIDAE, Colies
34 TROGONIDAE, Trogons
87 ALCEDINIDAE, Kingfishers
5 TODIDAE, Todies
8 MOMOTIDAE, Motmots
24 MEROPIDAE, Bee-eaters
16 CORACIIDAE, Rollers and Ground-rollers
1 LEPTOSOMATIDAE, Cuckoo-rollers
1 UPUPIDAE, Hoopoes
6 PHOENICULIDAE, Wood-hoopoes
45 BUCEROTIDAE, Hornbills
15 GALBULIDAE, Jacamars
30 BUCCONIDAE, Puff-birds
72 CAPITONIDAE, Barbets
11 INDICATORIDAE, Honey-guides
37 RAMPHASTIDAE, Toucans
224 PICIDAE, Woodpeckers, Piculets
14 EURYLAIMIDAE, Broadbills
63 DENDROCOLAPTIDAE, Wood-hewers
209 FURNARIIDAE, Ovenbirds
238 FORMICARIIDAE, Ant-thrushes
12 CONOPOPHAGIDAE, Ant-pipits
28 RHINOCRYPTIDAE, Tapaculos
90 COTINGIDAE, Cotingas
59 PIPRIDAE, Manakins
365 TYRANNIDAE, Tyrant Flycatchers

TABLE I—*Continued*

1	OXYRUNCIDAE, Sharp-bills
3	PHYTOTOMIDAE, Plant-cutters
23	PITTIDAE, Pittas
4	ACANTHISITTIDAE, New Zealand Wrens
2	PHILEPITTIDAE, Asities
2	MENURIDAE, Lyre-birds
2	ATRICHORNITHIDAE, Scrub-birds
74	ALAUDIDAE, Larks
75	HIRUNDINIDAE, Swallows
48	MOTACILLIDAE, Pipits, Wagtails
58	CAMPEPHAGIDAE, Cuckoo-shrikes
72	LANIIDAE, Shrikes
11	VANGIDAE, Vanga Shrikes
10	ARTAMIDAE, Wood-swallows
2	GRALLINIDAE, Magpie-larks
13	PRIONOPIDAE, Wood-shrikes
10	AEGITHINIDAE, Leafbirds
109	PYCNONOTIDAE, Bulbuls
5	CINCLIDAE, Dippers
63	TROGLODYTIDAE, Wrens
30	MIMIDAE, Mockingbirds
1360	MUSCICAPIDAE, Old World Insect-eaters
304	TURDINAE (incl. *Zeledonia*), Thrushes
261	TIMALIINAE, Babblers
19	PARADOXORNITHINAE (incl. *Chamaea*), Parrotbills
12	POLIOPTILINAE (incl. *Rhamphocaenus* and *Microbates*), Gnatcatchers
386	SYLVIINAE (incl. *Regulus*)
328	MUSCICAPINAE, Flycatchers
50	PACHYCEPHALINAE, Whistlers
65	PARIDAE, Titmice
17	SITTIDAE, Nuthatches
1	HYPOSITTIDAE, Coral-billed Nuthatches
5	NEOSITTIDAE, Australian Nuthatches
17	CERTHIIDAE, Creepers
54	DICAEIDAE, Flowerpeckers
106	NECTARINIIDAE, Sunbirds
80	ZOSTEROPIDAE, White-eyes
160	MELIPHAGIDAE (incl. *Promerops*), Honey-eaters
12	PRUNELLIDAE, Hedge-sparrows
426	FRINGILLIDAE, Finches, Buntings
197	THRAUPIDAE, Tanagers
36	COEREBIDAE, Honeycreepers
109	PARULIDAE, American Warblers
41	VIREONIDAE, Vireos
22	DREPANIIDAE, Hawaiian Honeycreepers
88	ICTERIDAE, Troupials
1	DULIDAE, Palm-chats
4	PTILOGONATIDAE, Silky Flycatchers
3	BOMBYCILLIDAE, Waxwings
263	PLOCEIDAE, Weavers
103	STURNIDAE, Starlings
13	CRACTICIDAE, Bell-magpies
3	CALLAEIDAE, Wattle-birds
20	DICRURIDAE, Drongos
32	ORIOLIDAE, Orioles
17	PTILINORHYNCHIDAE, Bowerbirds
100	CORVIDAE, Crows, Magpies, Jays
43	PARADISAEIDAE, Birds of Paradise
	Total Passeres 5093
	Total non-Passeres 3523
	Total birds 8616

bird of paradise group near the end. Portmann's recent work on the brain of the Corvidae supports this sequence. The reduction of the tenth primary is not considered by us as decisive a character, as it is by some other recent authors.

The total figure of 8,616 species is surprisingly close to my previous estimate. I judge that the figure is probably within five per cent, and certainly within ten per cent, of the final figure. The least accurate figures are those for the woodpeckers, larks, warblers, titmice, and finches. Whatever changes may occur in the future will be due primarily to taxonomic revaluations, that is to shifts from specific to subspecies status and vice versa. The period of new discoveries is practically at its end. I doubt that in the entire world even as many as 100 new species remain to be discovered.

Only twenty-three families contain 100 or more species. These are the Muscicapidae *sensu lato* (1360) [with the subfamilies Turdinae 304, Timaliinae 261, Sylviinae 386, Muscicapinae 328], Frin-

gillidae (426), Tyrannidae (365), Trochilidae (319), Psittacidae (315), Columbidae (289), Ploceidae (263), Formicariidae (238), Picidae (224), Furnariidae (209), Accipitridae (205), Thraupidae (197), Phasianidae (165), Meliphagidae (160), Anatidae (145), Rallidae (132), Cuculidae (127), Strigidae (123), Pycnonotidae (109), Parulidae (109), Nectariniidae (106), Sturnidae (103), and Corvidae (100).

On the other hand, among the total of 160 recognized families there are sixty-six families with less than ten species. The total for the non-Passeres is 3,523 species and that of the Passeres 5,093 species.

About seventy-five per cent of these species of birds are polytypic, that is they are composed of more than one subspecies; consequently the number of subspecies of birds is considerably higher than the number of species. I estimate that the number of valid subspecies of birds described by the end of 1945 amounted to about 28,500. This figure is increasing annually by about 200.

To give an estimate of the number of genera is very difficult in view of the current revolution of the generic concept. Ten years ago I estimated that about 2,600 genera of birds were recognized (Mayr, 1935). This amounts to about 3.3 species per genus. In recent revisions of the Pycnonotidae, Anatidae, Sturnidae, and Corvidae, Delacour, Mayr, and Amadon recognize an average of 4.75 species per genus. If this average were consistent it would result in the recognition of only 1,800 genera for the known 8,616 species of birds. Even so, birds are much more finely split generically than, for example, most groups of insects or plants.

A comparison of the number of species of birds with that of other groups of animals is appended. These figures are based in part on Hesse's (1929) tabulation, but utilize more recent data in several groups (for example, Smart, 1940). In the vertebrates only full species are counted; the figures are therefore much lower than those given in contemporary textbooks which do not distinguish between species and subspecies. The grand total for all animals was deliberately rounded to one million, by adjusting the estimates of various classes, to indicate that the figures are estimates and not actual counts. The disparity of the share the insects have in the grand total (75 per cent) is likely to get worse as time goes on. With new species of insects still being described even from our back yards, and with only an infinitesimal proportion of the tropical insects known, the frequently-made statement that only ten per cent of the species of insects are known, may be well-founded.

TABLE 2

ESTIMATE OF TOTAL OF KNOWN SPECIES OF ANIMALS

Mammals	3,500		
Birds	8,600		
Reptiles and Amphibians	5,500		
Fishes	18,000		
Vertebrates		35,600	
Tunicates and other lower chordates		1,700	
Echinoderms		4,700	
Deuterostomia			42,000
Insects	750,000		
Arachnoidea	30,000		
Myriapods	10,000		
Crustacea	25,000		
Arthropods		815,000	
Mollusks		88,000	
Worms of various phyla and other lower invertebrates		25,000	
Protostomia			928,000
Coelenterates and Ctenophors			10,000
Sponges			5,000
Protozoa			15,000
All animals			1,000,000

REFERENCES CITED

HESSE, R.
1929. Bericht über das "Tierreich." Sitzungsber. Preuss. Akad. Wiss., Berlin: XL–XLIV.

MAYR, E.
1935. How many birds are known? Proc. Linn. Soc. New York, Nos. 45–46: 19–24.

SHARPE, R. B.
1909. Handlist of the genera and species of birds, 5: xii.

SMART, J.
1940. Entomological systematics examined as a practical problem, in Huxley, The New Systematics: 477.

WETMORE, A.
1940. A systematic classification for the birds of the world. Smiths. Misc. Coll., 99 (no. 7).

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New York, N. Y.

CHIMNEY SWIFT 'THUNDER'

BY A. D. MOORE

GROSKIN, in the Auk for July, 1945 (Auk, 62: 361–372), has a very interesting account of large numbers of Chimney Swifts roosting in a large chimney at Ardmore, Pa. As Groskin states, Audubon and others have reported that when swifts enter or leave a hollow tree or chimney, a noise resembling distant thunder may be heard. Sutton mentions " . . . the thunderous booming of their wings as they sought new perches farther down." However, neither Groskin nor another observer (Mohr) detected any undue noise at the Ardmore chimney, although they were specifically listening for it. After discussing the flying-space limitations imposed on the birds by typical openings, Groskin concludes that "this limitation makes it highly improbable that they could produce a very loud noise with their vibrating wings."

Such a conclusion implies that Audubon, Maynard, Howell, and Sutton were not good observers; and, unwittingly, it also implies that pipe organs do not exist. The Ardmore chimney is 83 feet high. Little, if any of its resonance effects would be within the audible limits of the human ear. Groskin had the bad luck to listen for 'thunder' in a case that would yield little or no audible thunder. But there is no justification for generalizing from one case and, by ignoring resonance, denying the existence of 'thunder' in other cases.

Everyone is familiar with resonance in one way or another. When we shout into a cistern or an empty barrel, some of our tones are amplified to what may become a deafening roar. A cavity or pipe can resonate at a lowest (the fundamental) frequency, and at overtones (multiples) of that frequency. Overtones are also called harmonics. Quoting from Lemon and Ference ['Analytical Experimental Physics' (Univ. of Chicago Press)]: "Whenever an open or closed pipe is subjected even to an *entirely irregular* jumble of air pulses, those which happen to occur at intervals that exactly correspond to the fundamental frequency (or that of any of the pipe's harmonics) are amplified . . . ."

When swifts enter or leave a chimney at changing rates of, say, from five to 20 birds per second, and at random spacings, they are furnishing an irregular jumble of air pulses, and resonance is bound to occur. As will be seen later, they may also produce regular air pulses, leading to increased resonance effects.

This is not the place to expand on the theory of resonance. Any good physics textbook will cover the more usual parts of the theory. All we need do here is to make clear some of the possibilities as applied to swifts and their roosting places.

As a familiar basis for discussion, let us consider the lowest three octaves of the 88-key piano. The lowest string is usually tuned to have a fundamental frequency of around 27 cycles per second. This same string also produces overtones of frequencies 54, 81, 108, 135, 162, and so on. Going up the scale by octaves, we find strings with fundamental frequencies of 54, 108, 216, approximately (exact values depending on actual pitch used in tuning). If the keys within this range of three octaves are rapidly and irregularly fingered, noise like thunder is produced. Most of the sounds of distant thunder are found within this range.

An 'open' pipe is one that is open at both ends. The discussion will be strictly confined to this type of pipe, for the time being. A pipe having a length of about 21 feet will resonate at a fundamental frequency of 27, like the piano's lowest string; and, like that string, it will also resonate at the overtone frequencies of 54, 81, 108, 135, and so on. Swifts flying into the top of a 21-foot chimney would produce *irregular* air pulses, some of which would agree with these frequencies, and such tones would be amplified by resonance.

Regularity of air pulses from wing-beats would also be present. The frequency of the swift's wing-beat is sure to be somewhat variable, and it is probably somewhere between 10 and 20 beats per second. A wing-beat of 13.5 per second would produce a complex sound wave having a fundamental of 13.5, with overtones of 27, 40.5, 54, and so on. Thus, some of the overtones would be amplified by resonance in a 21-foot pipe.

Any pipe length can be studied by use of the formula, $N = c/(2L)$, where N is the pipe's fundamental resonant frequency; c is the velocity of sound—about 1,128 feet per second; and L is the approximate pipe length in feet. Assuming the Ardmore chimney to be an open pipe, we can very easily find that the frequencies of its fundamental and first several overtones would be approximately 7, 14, 21, and 28.

The lowest frequency typically heard by the human ear is about 20, and even this may not be heard unless the intensity is high. Thus, only the overtones of frequencies 28 and higher could be heard at the Ardmore chimney. Moreover, the rough general rule is that the higher the overtone, either in the source of the sound or of the resonant effects of a pipe, the weaker is the volume of that overtone. Still another effect comes in: the Ardmore chimney measures 3 by 4 feet in section, which means that a swift is small in comparison—thereby being relatively ineffective in inducing resonance in the first place. Groskin is a good observer; he should not have heard any loud noises at the Ardmore chimney.

The Ardmore chimney, in the part used for roosting, actually is a ventilator. As such, the lower end may well continue to a total length far beyond 83 feet, by virtue of connection to a duct. All of the frequencies would then be still lower, and still farther below the audible range.

The 'closed' pipe (closed at one end) is next considered. Some chimneys are closed pipes, being blocked at the bottom by dampers, fall of soot, and so on. A hollow tree need not have a bottom opening. Dr. Dow V. Baxter of our School of Forestry and Conservation assures me that certain fungi can cause disintegration of the tree interior if the top only is open.

To find N for a closed pipe, use $(4L)$ in the formula instead of $(2L)$. For the same lengths, the closed pipe frequencies are half those of the open pipe. Thus, if the Ardmore chimney happened to be dampered off, its fundamental would be 3.5 instead of 7, and any possibility of hearing it resonate would be still farther removed. Incidentally, the closed pipe does *not* resonate in the overtones of frequencies that are even multiples of the fundamental. The resonant frequencies of a 42-foot pipe are 27, 81, 135, etc.

The discussion has had a musical basis, and it might lead one to think that Sutton, for instance, should have heard rich organ tones—especially in view of the fact that he listened to a church chimney! Actually, the noise of "distant thunder" is to be expected in these cases, rather than music. Numerous factors enter in as causes, only some of which need be mentioned. Swifts enter irregularly, thereby setting up rapid volume fluctuations. Some wing-beats will produce frequencies a little different from the exact resonant frequencies of the 'pipe'; these will be amplified somewhat, but they will produce discords. The resonant frequencies themselves will change somewhat during the flights of the birds; when enough of the opening is taken up by bodies to be appreciably blocked, these frequencies will change. Probably the greatest cause of volume fluctuation will be due to the random way in which several pairs of wings may beat in or out of phase with each other; when they happen to change from helter-skelter to approximate unison of group wing-beats, in successive groups, very large changes in sound volume would certainly result.

By using the above formula on a few cases, it will readily be seen that most chimneys and many hollow trees offer rich possibilities for the production of chimney swift "thunder." Audubon was right!

August 4, 1945
University of Michigan
Ann Arbor, Michigan

THE CANVAS-BACK IN MINNESOTA

BY J. DONALD SMITH

INTRODUCTION

As a part of the migratory game bird investigations conducted under a State Pittman-Robertson Research Project, a study was made of the Canvas-back (*Aythya valisineria*) in Minnesota. Certain phases of the duck's life history lend themselves admirably to intensive investigation. This is particularly true during migration when the Canvas-backs concentrate in large numbers on only a few lakes in the state. Intensive studies were made of the spring and fall migrations of 1941–1943 on Lake Christina, near Ashby in Grant County, Minnesota. Other studies, carried on over a large part of the state, provided general information about the species.

HISTORY

Since a discussion of the Canvas-back in Minnesota would not be complete without a review of Lake Christina, a brief history and description are presented. Before 1900, no Canvas-backs were ever seen on any of the lakes in the Ashby region. Redheads and bluebills (scaup ducks), however, were common. After 1900, 'Cans' began to appear on Lake Christina. From that date on, the number using the lake has increased yearly up to the present time. There have been years when a large part of the Canvas-back migration missed Lake Christina, but each following year the birds were back again in great numbers. One possible reason for this increased use of Lake Christina is the deterioration of Heron Lake in southern Minnesota, Pomme de Terre in west-central Minnesota, and Lake Shetek in the southwestern part of the state, due to the increase of carp and the drouth of the 1930's.

There is little information concerning the waterfowl found on Lake Christina prior to 1870, but it is quite possible that at an earlier date the Canvas-backs used it to the same extent as they do today.

The lake is attractive to the Canvas-backs, due apparently to the following conditions. It is large, having a surface area of 4,023 acres. It is shallow, having an average depth of only five feet. There is almost no emergent vegetation. Tremendous volumes of sago pondweed (*Potamogeton pectinatus*), widgeon grass (*Ruppia occidentalis*), and spiny naiad (*Najas marina*) occur there. Oddly enough, there is no wild celery (*Vallisneria spiralis*). These conditions allow the birds to feed, rest, and carry on courting activities over the entire

area of the lake with little danger of disturbance. The lack of emergent vegetation makes it impossible for hunters and predators to approach unobserved. In this respect the lake provides an outstanding illustration of the importance of continuing the present prohibition of open-water shooting as provided by Minnesota game laws.

No lake, which the writer has seen, contains a greater volume of the preferred types of submerged aquatic waterfowl food plants than Lake Christina. Because of the very limited distribution of widgeon grass in Minnesota, it was formerly thought that its presence in large quantities in the lake made the waters unusually attractive. Subsequent examinations of eighty-eight Canvas-backs, however, revealed that the seeds and tubers of sago pondweed occurred in ninety-five per cent of the gizzards while widgeon grass was present in only trace amounts.

This food preference seems to be further evidence that the sago pondweed is an outstanding duck-food plant. Its abundance in Lake Christina is undoubtedly one of the most attractive features of the lake.

SPRING MIGRATION

The Canvas-backs appear in Minnesota as soon as the lakes and marshes begin to open up in the spring. When the Meadow Larks and Red-winged Blackbirds arrive, the 'Cans' are not far behind. In 1941, the first birds were seen on April 4, near Minneapolis; in 1942, on March 29, near the same place; and in 1943, on April 1, at Shakopee near Minneapolis.

The distribution of the Canvas-back in Minnesota in the spring is limited almost entirely to the area around Ashby. Approximately fifty thousand Canvas-backs gather in this area sometime during the month of April each year. Only small flocks, seldom numbering more than several dozen birds, may be seen each year on other areas scattered over the state. Occasionally, a large flock of birds has been reported on one of the many lakes near Wilmar, in south-central Minnesota, but they stay only a day or two and then move on, presumably to the region around Ashby.

Intensive studies indicate that the Canvas-backs migrate through Minnesota in definite waves. In 1942, the migration as observed on Lake Christina occurred in three rather definite movements. The first wave, less distinct than the others, was spread over five or six days. The second wave was more marked and occurred between April 5 and 10. During this time a peak in the numbers of migrants was apparent but of short duration. A third wave appeared

on April 17, which brought the population to another peak that lasted one day. The number of remaining birds gradually dwindled until May 1, when only a few paired birds were left. By May 15, all migrating Canvas-backs usually have left the state.

The actual population of Canvas-backs on Lake Christina during April, 1942, was as follows: April 4—2,000; April 5—5,520; April 6—3,000; April 8—6,000; April 9—9,250; April 10—10,400; April 11—26,400; April 12—31,000; April 13—28,500; April 14—12,500; April 16—6,350; April 17—25,000; and April 18—2,500.

COURTSHIP

Some time was spent studying the progress of the Canvas-back courtship on Lake Christina in 1942. Not until two days after the first flight appeared could any pairs be distinguished. On April 9, five days after the first arrivals, it was estimated that ten per cent of the birds were paired. Pairing increased until April 16, when it was estimated that sixty-five per cent of the birds were mated. The first flight left the lake on April 16, and the second flight arrived two days later. The percentage of birds which appeared to be paired dropped to eighteen per cent immediately after the first wave departed. Because the second flight stayed on the lake only one day, it was impossible to trace further progression of the courtship.

In 1943, the first birds arrived at Lake Christina on April 11. Out of a flock of 2,000 Canvas-backs, only four pairs were seen. Each day following the initial count, the number of pairs increased until April 18, when it was estimated that fifty per cent of the population were paired. Although there were fewer present on the lake in 1943, the same trend in courtship was observed, thus substantiating the findings of the year before.

In the first flights, practically all of the courting parties, which at this early stage contain from six to ten drakes to one hen, are engaged in prenuptial courting activities. As the season progresses, the courting parties diminish in size until, at the peak of the migration, many have but three or four males to one hen. It is sometimes difficult to distinguish the courting parties as units because of the rapid shifting of attendance of the males from a female in one party to a female in another.

Several days after arrival, when the birds have paired, they separate from the main flock and swim about mostly by themselves. This separation becomes very marked near the peak of the migration; and it is not unusual to see a flock of several thousand birds in close association about 100 yards off shore, all very actively engaged in

prenuptial courting antics. Separated from the main flock are many pairs of birds loafing together along the shores, obviously enjoying each other's company, others diving and flying short distances almost in unison, and still others trying to defend their solitude against encroachment by lone, wandering, less fortunate males. Copulation apparently occurs soon after pairing. The first mating act was observed in 1942 on April 14. In 1943 it was seen on April 10, and was noted to occur frequently after those dates both years.

This study of the Canvas-back courtship verified in almost every detail the excellent description of that behavior presented by Hochbaum (1944). It differed in only two respects—the size of the courting parties and the dates of the first observed copulation. The evidence, as presented here, indicates that the part of the continental Canvas-back population migrating through Minnesota in the spring begins its courtship here. The majority of the birds are paired when they leave the state.

SEX RATIOS

When the first flight of Canvas-backs came into Lake Christina in April, 1942, the sex ratio, as shown in Table 1, was predominantly in favor of the male—2.3 males to one female. As the season advanced, the sex ratio became more even. At the peak of the migration it was 1.2 males to one female. This seems to indicate that there is a differential movement, with the males flying northward ahead of the females and waiting on the courting grounds for the latter to arrive. The average sex ratio of 1.6 males to one female, as seen in Minnesota birds, is slightly more disproportionate than that reported by Hochbaum in Manitoba (1944).

NESTING

The Canvas-back has never been an important nesting duck in Minnesota. The two most important nesting areas at the turn of the last century were Heron Lake, in Jackson County, and Thief Lake, in Marshall County. Dr. T. S. Roberts visited both areas and found nests and broods of Canvas-backs on Heron Lake in 1898, and in 1900 observed many broods on Thief Lake. It was his opinion that Thief Lake was a more important Canvas-back nesting ground than Heron Lake at the time he visited the areas. There are few records of nests in other parts of the state for this species.

At present it nests in the state in comparatively insigificant numbers. Systematic brood counts conducted by the writer in 1942 on sixteen areas scattered over the prairie region of the state yielded only thirteen broods and forty-six adults, including maternal hens

on five of sixteen areas. The number of young Canvas-backs represented only two per cent of the total young of all species of ducks observed on the same areas. It was, however, an increase over 1941, when only six broods were seen on one area out of ten studied. Further evidence of nesting in 1942 was furnished by observers who reported seeing broods of Canvas-backs on lakes where they have never found this species before during the summer. Until recent years no Canvas-backs were known to have nested on Lake Christina, but now a few pairs have been staying all summer, and at least two instances of nesting have been reported by reliable observers.

In 1943 and 1944, further observations were made on nesting 'Cans.' In 1943, nine broods and thirty-five adults were seen on two of seven areas. The number of young represented 7.3 per cent of the total young of all species of ducks seen. In 1944, only two broods were seen on one out of four areas.

FALL MIGRATION AND HUNTING

It is probable that Minnesota lies in the principal migration route of the Canvas-back, for its flight from the prairie provinces of Canada is largely south and east to the wintering grounds along the Gulf of Mexico and the Atlantic coast. This is further supported by the fact that about six per cent of the continental Canvas-back population stops in the spring on Lake Christina (Lincoln, 1942). Little is known of the movements of these birds to and from Minnesota.

Of eleven banded at Thief Lake in the early fall of 1942, four were recovered. An adult female, banded on August 28, was shot at Lake Christina on September 30, 1942. A juvenile female, banded on September 5, was shot at Fergus Falls, Minnesota, on October 8, 1942. A juvenile male, banded on September 5, was shot at Savannah, Georgia, on December 30, 1942. A juvenile female, banded on September 15, was killed in Calvert County, Maryland, on December 16, 1942.

The Canvas-back migration in the fall is quite similar to the movement as reported by Hochbaum at Delta, Manitoba (1944), except that the arrival and departure dates differ as would be expected in view of the difference in latitude of the two areas. Usually the fall migration is an orderly movement. The birds appear on Lake Christina between October 5 and 10, and the peak of the migration occurs about October 15. The birds begin to leave the lake approximately on October 25, and by the end of the month all of them have left the region. There are some variations which are apparently caused by weather conditions. When there is stormy weather in Canada,

Canvas-backs appear on the Minnesota lakes in late September. In the fall of 1942, the first birds arrived on Lake Christina on September 23. After that date they poured into the lake until a peak population was reached on October 17, when there were an estimated sixty thousand Canvas-backs. On the 21st, the weather became stormy, and the ducks began to leave the lake in large numbers. About ten thousand remained until the 25th, when the lake froze over.

One striking difference between the fall and spring migrations on Lake Christina was in the flock formations. In the spring each species remained in a fairly compact group. The Canvas-backs formed a ribbon all around the lake shore. The Coots gathered in large flocks farther out in the lake as well as in flocks near the shore. The Redheads formed long strings usually out in the middle of the lake. The Ring-necks, Lesser Scaups, and 'puddle ducks' concentrated in the bays. In the fall, however, this segregation was not apparent. The birds united far out in the middle of the lake in a large, heterogeneous flock. Perhaps this distribution of the species may be explained by the courting activities carried on in the spring and the lack of these activities in the fall. The distribution may be influenced also by the condition of the feed beds during the two seasons.

The wintering areas studied by the author in Minnesota have never had Canvas-backs, and there are few records of this species wintering in the state.

Sex and Age of Birds in Hunters' Bags

A bag tally of the Canvas-backs shot on Lake Christina was made in the fall of 1942. The object was to determine the sex and age ratios of the birds. The data are presented in Tables 2 and 3. The sex ratio was much more even than that reported by Hochbaum (1942) of birds shot on the Delta marshes. At Christina the sex ratio of adults was one male to 1.2 females, while at Delta, in 1941, it was one male to 2.2 females. The sex ratio of both juveniles and adults taken at Delta was one male to 1.8 females, but at Ashby the ratio was one male to 1.05 females.

Comparing the age ratios of Canvas-backs shot at Lake Christina and at Delta, it was found that the proportions were almost the same. During 1939, 1940, and 1941, the age ratio at Delta was one adult to 5.7 young and one adult hen to 8.2 young. The Christina ratio was one adult to 5.5 young. The adult hen-juvenile ratio of one to 10.1 seems too high to be a true reflection of the Canvas-back's yearly increase. It is quite possible that this ratio bears out the

contention of the old-time hunters that the young birds are easier to shoot because they decoy more readily than the old 'white backs,' and because they tend to fly lower over the points and the passes. However, this supposed difference was not observed by the writer. It is true, he shot more young birds than old, but no flight or decoying differences were noted in the age classes.

ACKNOWLEDGMENT

The work was done under the Federal Aid in Wildlife Restoration Project 11-R of the Minnesota Division of Game and Fish, Department of Conservation. Several of the research staff assisted with the field studies. In addition, Fred Johnson, game warden at Ashby, Minnesota, rendered very valuable assistance. Arnold B. Erickson edited and presented the manuscript in its final form.

SUMMARY

In 1941 and 1942, a study of the spring and fall migrations of Canvas-backs was made at Lake Christina near Ashby, Minnesota. Approximately six per cent of the continental population of Canvas-backs stops on migration at Lake Christina. The lake is attractive to the birds apparently because it is large and shallow, with no emergent vegetation, and contains a tremendous volume of sago pondweed, widgeon grass, and spiny naiad. Of eighty-eight Canvas-back gizzards examined, ninety-five per cent contained sago pondweed; widgeon grass was found in only trace amounts.

The spring migration of Canvas-backs at Lake Christina in 1942 occurred in three definite movements. The first, less distinct than the others, was spread out over six days. The second occurred between April 5–10, and the third on the 17th when 25,000 birds were counted.

On April 9, 1942, ten per cent of the Canvas-backs on Lake Christina were paired; on the 16th, 65 per cent were paired. On April 11, 1943, only four pairs were seen in a flock of 2,000 birds; by April 18, fifty per cent of the birds were paired. Once paired, the birds separate from the main flock. The separation becomes marked near the peak of the migration when several thousand birds may be seen in close association about 100 yards off shore, all engaged in prenuptial courting antics. In 1942, the first copulation was seen on April 14; in 1943, on April 10.

The sex ratio of the first flight of Canvas-backs in April, 1942, was 2.3 males to one female. At the migration peak it was 1.2 males to one female. The average ratio was 1.6 males to one female.

Brood counts made in 1941 through 1944 indicated that the Canvas-back as a nesting species has increased in Minnesota during the last few years.

The fall migration of the Canvas-backs at Lake Christina is an orderly movement. The birds arrive between October 5 and 10, reach a peak about the 15th, and begin to leave the lake about the 25th. By the end of the month all have left.

Of eleven Canvas-backs banded at Thief Lake in the fall of 1942, four were recovered the same fall—one at Lake Christina on September 30, one at Fergus Falls, Minnesota, on October 8, one in Calvert County, Maryland, on December 16, and one at Savannah, Georgia, on December 30.

A bag tally of Canvas-backs shot on Lake Christina, in the fall of 1942, was made to determine the sex and age ratios of birds. The sex ratio of adults was one male to 1.2 females and of juveniles, one male to 1.05 females. The age ratio was one adult to 5.5 juveniles. The ratio of adult hens to juveniles was one to 10.1; this seems too high to be a true reflection of the Canvas-backs' yearly increase.

TABLE 1

SEX RATIOS OF CANVAS-BACKS ON LAKE CHRISTINA, MINNESOTA, APRIL 4–18, 1942

Date	*Male*	*Female*	*Ratio*	*Total*	*Estimated percentage paired*
4	355	157	2.2 : 1	512	—
5	200	80	2.5 : 1	280	0
6	470	273	1.7 : 1	743	0
7	120	48	2.5 : 1	168	—
8	101	57	1.7 : 1	158	—
9	503	282	1.7 : 1	785	10
10	818	501	1.6 : 1	1,319	25
11	1,174	795	1.4 : 1	1,969	30
12	241	191	1.2 : 1	432	—
13	386	258	1.4 : 1	644	32
14	268	196	1.3 : 1	464	38
15	110	75	1.4 : 1	185	50
16	314	192	1.6 : 1	506	65
17	292	205	1.4 : 1	497	18
18	175	99	1.7 : 1	274	—
Total	5,527	3,409	1.6 : 1	8,936	

TABLE 2

SEX RATIO OF CANVAS-BACKS SHOT AT ASHBY, MINNESOTA, 1942

Juveniles			*Adults*			*Total*		
Male	*Female*	*Ratio*	*Male*	*Female*	*Ratio*	*Male*	*Female*	*Ratio*
200	205	1 : 1.02	33	40	1 : 1.2	233	245	1 : 1.05

TABLE 3

AGE RATIO OF CANVAS-BACKS SHOT AT ASHBY, MINNESOTA, 1942

Adult Both sexes	*Juvenile*	*Ratio*	*Adult female*	*Juvenile*	*Ratio*
73	405	1 : 5.5	40	405	1 : 10.1

LITERATURE CITED

HOCHBAUM, H. ALBERT
1942. Sex and age determination of waterfowl by cloacal examination. Trans. Seventh N. Am. Wildlife Conf.: 299–307.
1944. The Canvasback on a prairie marsh. Am. Wildlife Institute, Washington, D. C.

LINCOLN, FREDERICK C.
1942. (Letter to the author, May 20, 1942.)

ROBERTS, T. S.
1932. The birds of Minnesota, Vol. 1.

Division of Game and Fish
Department of Conservation
State of Minnesota
St. Paul, Minnesota

GENERAL NOTES

A new drongo from the Moluccas.—During a revision of the family Dicruridae, now in the process of preparation, two specimens of *Dicrurus hottentottus* from Morotai Island in the Rothschild Collection, American Museum of Natural History, were examined. These two specimens were identified as *Dicrurus atrocaeruleus* Gray. A comparison with typical *atrocaeruleus* from Halmahera showed that the Morotai birds belong to an undescribed race which I propose to call

Dicrurus hottentottus morotensis, new subspecies

TYPE: A.M.N.H. No. 672587; Rothschild Coll.; non-sexed adult; Morty [Morotai] Island; no date; Dumas Coll.

DIAGNOSIS: Similar to neighboring *atrocaeruleus* from Halmahera but considerably smaller in all measurements. Similar to *carbonarius* of New Guinea but with a shorter, less deep, and much more delicately shaped bill.

MEASUREMENTS: Length of the bill taken from the anterior border of the nostril, 19.5, 20 (19.75) mm.; wing, 148, 149 (148.5); outer tail feather, 134; central tail feather, 115, 115; depth of the fork, 19.

Corresponding measurements of 16 adult specimens of *atrocaeruleus:* bill, ♂ 22–25.5 (23.44), ♀ 22–24 (23); wing, ♂ 168–181.5 (171.93), ♀ 162.5–165 (163.5); outer tail feather, ♂ 150–165 (155.57), ♀ 142–153 (147); central tail feather, ♂ 132–143.5 (139.27), ♀ 131–139 (133.66); depth of the fork averages, ♂ 16.3; ♀ 13.34.

Length of the bill in *carbonarius,* 262 specimens: ♂ 19–24.5 (21.88), ♀ 18.5–24 (21.30).

Depth of the bill at nostril: *morotensis,* 10, 10; *carbonarius,* 6 ♂: Numfor, 13; Waigeu, 12.5, 13; Bernhard Camp, 12.7, 12.8, 13.2 (average of 6 ♂ 12.86); *atrocaeruleus,* 6 ♂: Halmahera, 12, 12, 12.5, 13, 13, 13.5 (12.66).

RANGE: Morotai Island.

DISCUSSION: Although only two specimens have been examined, they differ so strikingly from a large series of *atrocaeruleus* and *carbonarius* that the naming of this race seems necessary. Furthermore, the new race indicates a trend toward reduction in size and, with the exception of the length and furcation of the tail, resembles the otherwise isolated Philippine race, *striatus,* and is thus of considerable phylogenetic and zoogeographic interest. A more detailed discussion of this form will be presented at a later date in the revision of the family.

I take great pleasure in expressing to Dr. James P. Chapin and Dr. Ernst Mayr of the American Museum of Natural History my gratitude for their inspiring guidance and the many suggestions with which they are helping me in the course of this work.—A. J. C. VAURIE, *American Museum of Natural History, New York.*

Age in relation to migration in the Blue Jay.—Recently, Dexter (Bird-banding, 16: 64–65, 1945) has reported some interesting banding returns of the Blue Jay (*Cyanocitta cristata*). He cites a series of other reports published earlier in the same journal, including a paper by Gill (Bird-banding, 12: 109–112, 1941), in which an attempt was made to detect some explanation of the partial migration characteristic of that species. Gill concluded (p. 112): "It is probable that a migratory movement does occur among this species [it seems to me that any doubt on this point was adequately dispelled before 1941], particularly among the younger birds, and that with advancing age, Blue Jays become more a resident

of their nesting area and less prone to desert it due to weather conditions, except in the extreme northern part of their range." Although the Blue Jay is known to migrate from and to northern localities, the occurrence of movements other than autumn wandering among jays of central and southern states has yet to be demonstrated. In central Indiana, Test and Test (Proc. Ind. Acad. Sci., 48: 230, 1939) found "no positive evidence of any migration and some evidence that there is little or none."

The chief difficulty with the available data on the movements of the Blue Jay has been the lack of any information on the age of individuals (Gill, *op. cit.*: 109). If first-year birds, for instance, could be distinguished from older birds, and if banders of Blue Jays could record the age of trapped individuals as juvenal, first-year, or adult, a real grasp of the problem would probably be possible. Actually, among corvids, first-year birds can, with practice, be distinguished easily from adults. Several years ago, Emlen (Condor, 38: 99–102, 1936) described in detail differences between first-year and adult specimens of *Corvus*, but to my knowledge his results have not been used in study of the Blue Jay.

Characters used in distinguishing first-year from adult individuals are differences in the flight feathers and wing coverts of the two groups. During the postjuvenal molt of corvids, the juvenal rectrices and remiges are retained as are the greater primary coverts, alular feathers, and a variable number of the greater secondary coverts. There are exceptions; in *Cyanocitta cristata*, for instance, some of the proximal secondaries may be replaced during the postjuvenal molt, or all of the juvenal greater secondary coverts may be retained, or the rectrices may be replaced. Details of the nature of the differences between corresponding feather series will not be given here as they are available for *Corvus* (Emlen, *loc. cit.*) and *Aphelocoma* (Pitelka, Condor, 47: 254–256, 1945). The most satisfactory of the several usable differences is that of the color of the wing coverts. In *Cyanocitta cristata*, the juvenal greater secondary coverts are dull blue, unbarred, and tipped with white; the corresponding adult feathers are bright blue, barred with black, and tipped with more white. The juvenal greater primary coverts and alular feathers are dull blue, grayish terminally; the corresponding adult feathers are darker blue, usually with some suggestion of barring, especially on the alular feathers. First-year birds can be recognized most easily when the replacement of secondary coverts has been incomplete, as then there is an obvious contrast between the retained juvenal feathers, which are distal, and the proximal replaced ones.

Of 97 specimens of *Cyanocitta cristata*, excluding juvenal, non-sexed, or undated specimens, in the collections of the Museum of Vertebrate Zoology and the California Academy of Sciences, 48 are adults, 46 are first-year birds, and three are in early stages of the first complete molt—that is, they are slightly over a year old. Among the 46 first-year specimens, 29 retained no juvenal greater secondary coverts, five retained one, six retained three, four retained three, one retained four, and one female retained all. Twenty-nine of these were collected north of the Mason-Dixon Line, and only four of these 29 were collected during the months of December, January, and February. The localities represented by the four winter-taken specimens are Beaver Dam, Wisconsin, Holley, New York, and Princeton, New Jersey; none of these is north of latitude 44° N. Gill's theory that it is the younger birds which undertake most of the observed migration may apply chiefly to northernmost populations of *Cyanocitta cristata;* it may apply only in part to populations of northeastern states and not at all to populations from approximately 40° N. latitude southward. This statement is merely a suggestion based

on meager evidence. In *Aphelocoma*, the available evidence indicates that first-year birds may wander or disperse over great distances, whereas adults are typically sedentary (Pitelka, MS.).

Obviously, the problem of migration in Blue Jays, and in other species in which plumage differences of the type described above occur, can be approached adequately only if bird banders are aware of the type of information needed and have a knowledge of the morphological bases for distinguishing age groups. I would urge interested students and banders not to attempt aging individuals without first examining a museum series and becoming familiar with seasonal variation due to wear as well as individual variation.—FRANK A. PITELKA, *Museum of Vertebrate Zoology, Berkeley, California.*

Rumbling noise made by Chimney Swifts in chimney.—In the Auk, 62: 361–370, 1945, there is an interesting article by Horace Groskin, "Chimney Swifts roosting at Ardmore, Pennsylvania." Reference is made to very loud noises which some observers report to have heard as the birds departed from the chimney or hollow tree at dawn. This noise has been likened to the rumbling of distant thunder.

It may be of interest to report my own experiences with the swifts on this point. My childhood up to the age of 19 years was spent on an old New England farm at West Oxford, Massachusetts. This farmhouse was one of the oldest in town and at that time was about 125 years old. An enormous stone chimney occupied the middle of the house, and the portion above the roof made of brick, was about 3–3½ feet square within. The stone chimney itself was constructed from the ground floor of the cellar, and was so spacious as to occupy a large portion of the cellar area, as well as the middle of the ground story above. This enormous stone chimney appears to have been built originally to accommodate a spacious Dutch oven as well as huge fireplaces for all the first-story rooms. Central cross walls of brick divided this chimney into four equal flues, some of which appeared to lead to rooms the fireplaces of which were no longer used.

This large chimney was always frequented by the swifts with their nests each season, and they roosted within it in late summer. This large chimney passed through an open, unfinished attic near a room at one end of the house which was my sleeping room. I could plainly hear the movements of the swifts within the chimney at all times, and I felt a sense of companionship with these fine birds always so close to my bedroom. On rare occasions I have heard them chipper at night as they roosted, but frequuently I have heard the rumbling of these birds, and was always puzzled as to how it was made even on nights so dark that it was certain the birds were neither entering nor leaving the chimney.

I am, for this reason, inclined to believe that something may occasionally disturb the birds as they cling to the chimney walls in close arrangement, and that this causes a simultaneous flapping of the wings of many birds so that a reverberation within the chimney is produced. I have frequently heard the rumbling when the birds were all within the chimney, but have never noted any such noise while the birds were merely settling into the chimney at dusk or leaving it at dawn, although conceivably a great mass of frightened, surging birds suddenly leaving a chimney might set up a rumbling sound. This rumbling, I am certain, can be made without this exodus, and sometimes may be the result of a vigorous wing stretching or flapping performance which is taken up simultaneously by a group of birds, perhaps finally to extend to larger numbers in the chimney.—H. A. ALLARD, *Beltsville, Maryland.*

Morning display of the California Condor.—For many years there have been examples of the California Condor (*Gymnogyps californianus*) in the collection of The National Zoological Park. At present one specimen is exhibited, a large female. A behaviorism of this bird in captivity is interesting. At sunrise, this great vulture greets the sun by facing the east and spreads its wings in a horizontal position—an expanse of about eight feet. In this posture she remains for as much as an hour. The head of the bird meanwhile undergoes a peculiar transformation. Normally, the soft parts of the head are a pale yellow in color, and the neck is gray with the exception of the posterior portion which is tinged with red. During the 'sun-worship stance,' these soft parts of the head turn from pale yellow to an intense, bright yellow, and the entire neck becomes a dark crimson. At this period the bird appears to be in a state of emotional unrest. During the winter months and the period of molt the Condor does not exhibit the changes mentioned.—MALCOLM DAVIS, *National Zoological Park, Washington, D. C.*

Bald Eagle feeding on the highway.—On June 12, 1945, Mrs. Hawkins and I, with a friend, were driving through the Smokies to our summer home at Lake Junaluska, North Carolina. We had crossed over New-found Gap, and as we were nearing Smokemont, N. C., we were much surprised to see an eagle feeding upon some small animal that had been killed by a passing car. Thinking that it might circle and return to its feeding, we drew up about fifty to one hundred yards beyond the spot. Sure enough, it circled, and again alighted by the roadside. The three of us were out of the car and had our glasses on it. We noted the bare tarsi, and so concluded that it was an immature Bald Eagle. It did not resume feeding but strutted about uneasily for a minute or two, and then took flight into the near-by woods.—ROBERT M. HAWKINS, *Lake Junaluska, North Carolina.*

Observations on two Golden Eagles.—The Golden Eagle is a regular winter visitor in central Tennessee, especially along the escarpment known as the "Highland Rim" that forms the eastern border of the "Nashville Basin." During the first week in February, 1945, a farmer presented Mr. Henry O. Todd, Jr., of Murfreesboro, Tenn., with a Golden Eagle which had been captured after it had killed a fox that had been caught in a steel trap. Two other eagles were said to have been killed in the same area (Pilot Knob) earlier in the winter, and four more in another area (Auburntown) some twenty miles away. On Feb. 18, Mr. Todd, Mr. Albert Ganier and the writer visited Pilot Knob, where we watched an adult Golden Eagle circling over an adjacent quarry. A week later another eagle was caught in the same place and presented to Mr. Todd, who stated that the farmers aver that the eagles appear in winter ("lambing time"), that more were seen "last year," and that "brown eagles" and "black eagles" were to be distinguished. The latter may refer to immature Bald Eagles. Inasmuch as the two eagles examined were as unlike as would seem possible within the limits of variation based on age and sex, it seems worth-while to append a brief description of each.

The first eagle weighed 14 lbs., with the wing of 25½ inches long and the tail 14 inches. The plumage was dark brown, with a distinct purple gloss. The flight feathers were much darker than the contour feathers, while the greater wing-coverts were intermediate. The longer, more posterior scapulars were also very dark, and it is possible that these are the 'girdle' counterpart of the flight feathers of the free part of the wing. The basal part of the inner primaries was clear white, as was the basal two-thirds of the tail. The terminal brown band on

the tail was four inches wide on the middle feathers, and six inches wide more laterally. The nape and posterior half of the crown were tawny, the eyes brown, and the feet, cere and gape deep yellow. The feathers were relatively fresh and seemed to be of equal age, indicating an unmolted bird. While the above plumage would seem to be that of a first-year immature, according to most descriptions, contrary accounts are to be found in Roberts's 'Birds of Minnesota' and in Coues's 'Key to North American Birds.'

The second eagle weighed 8 lbs., with the wing 23½ inches and tail 12¼ inches. There was no trace of white on tail or wings, which were strongly barred with gray and brown in 'Goshawk' style, but there was a clear white 'epaulette' in the upper part of each scapular tract, which showed clearly only when viewed from in front as the eagle lowered its head to feed, at which a white spot appeared on each shoulder. The general plumage was brown, but presented an intermixture of new and old feathers; some were fresh with purple gloss, some more worn and without the gloss, and others so faded and worn as to be nearly white, with the free part of the feathers completely frayed. The nape and posterior part of the crown were tawny, the eyes reddish (somewhat similar to *Accipiter*), and the feet, cere, and gape pale yellow.

In a very limited search of some easily available literature, the writer was unable to find any account that would completely explain the plumage described above. Forbush, in 'Birds of Massachusetts,' and Bent, in his 'Life Histories,' state that the Golden Eagle has a complete annual molt. Witherby (*et al.*) in the 'Handbook of British Birds' mentions a "complete molt" but adds that it may be very gradual. However, in a further statement, this last work adds that the molt may begin in April and end "occasionally" in June, but "sometimes" not until October. It is obvious that an eagle with an April–June molt would be unable to fly during a great part of that period. The age differences in feathers (estimate based upon 'wear') in the description furnished above are not to be explained in terms of a complete annual molt.

On the other hand, a posthumous paper by Sewertzow (Moscow, 1885–1888) entitled 'Étude sur les variations d'age des Aquiline's palearctiques et leur valeur taxonomique' contains what appear to be pertinent descriptions. Sewertzow states that the molt begins when the eagle is about 15 months old, is incomplete, ceasing during the following winter, and is only complete more than a year later when the bird is three years old, at which time it begins without pause its second molt, complete at five years. The third molt is complete at seven years (when the eagle may breed), and the fourth at nine years of age (*contra* Witherby, who states that the bird completes its fourth molt at about four and one-half years and then appears to become adult). According to Sewertzow, at any one time the plumage may consist of fresh feathers (with purple reflections), older feathers (without reflections), and very old, faded feathers; these represent feathers "new," a year old, and two years old, respectively. It is further noted that a bird that has nested the same season shows many more old feathers, and that non-breeding birds have many more new ones. It is clear that the descriptions of Sewertzow may be applied satisfactorily to the description of the second eagle given above, and this calls into question the accuracy the statements found in more recent accounts.

In regard to the white 'epaulettes,' easily accessible American references with which the writer is familiar fail to mention these characters, and here again Sewertzow has something to say. Pointing out that they were figured by Naumann ('Naturgeschichte der Vögel Deutschlands,' 13: pl. 339), Sewertzow states that they

are of very rare occurrence, that he had never seen complete examples, and that it was possible that they occurred in Scandinavia and Finland. He states that they are not age nor sex characters. The subject would seem to need further clarification.

Of further interest is the pattern of new and old feathers among the remiges. Assuming that this pattern (nearly identical in each wing) represents the order of feather replacement in the molt, it may be pointed out that the pattern was such as to find no ready explanation in terms of the simple regular replacement order in *Accipiter gentilis* or the slightly more complex situation in *Falco rusticolus* and *peregrinus* with which the writer has personal acquaintance. A regular molt proceeding from a molt center does not seem adequate to explain the fact that primaries numbers 2, 5, 9, and 10 were new, numbers 1, 3, 4, and 6 somewhat intermediate, and 7 and 8 definitely older. The primary coverts (studied from Kodachrome transparencies) were approximately similar, with a few exceptions. In the secondaries, numbers 1, 2, 4, 5, and 8 were new and 3, 6, and 7 old, while the inner secondaries varied somewhat on each side. It is hoped that the future molts of the immature eagle will furnish information on both plumage and molt sequences.

In conclusion, it may be pointed out that whereas the Golden Eagle may still be a resident in the southern Appalachians, the winter eagles are in all probability mostly migrants from an unknown northern breeding area. In the fall of 1944, sixteen Golden Eagles were observed to pass Hawk Mountain (Pennsylvania) in one day, and Mr. Richard Pough saw seven flying along a ridge in western New Jersey in late October, 1944. It is not unreasonable to suppose that some of these may later be found in central Tennessee. The Highland Rim country is very steep, consisting of 'badlands' largely given over to pastureland (sheep, some cattle, and pigs), somewhat grown over with sparse cedar and some hardwoods. As a potential food supply, rabbits are very numerous (15 counted in a half-hour walk), and carrion (dead calves, sheep) is to be found. No doubt the steep hills furnish excellent obstructional air-currents for soaring flight, as well as some 'cover' for these large and conspicuous birds.—WALTER R. SPOFFORD, *Nashville, Tennessee.*

Purple Gallinule robs nest of Green Heron.—There is a pond on my property in Leon Co., Florida, where Eastern Green Herons (*Butorides v. virescens*) nest in button-bushes, over the water. A few pairs of Purple Gallinules (*Porphyrula martinica*) nest in the grass. On May 6, 1945, a friend and I were paddling quietly about in a boat when a Purple Gallinule flew towards a button-bush in which I knew there was a Little Green Heron's nest containing four eggs. This nest was placed unusually low—about 15 inches above the water on bent-over branches, and though well sheltered from above was exposed to view from either side.

When about 30 feet away, we saw that a fight, accompanied by wing blows, was taking place at the nest between the gallinule and the heron. It was over by the time we were within 20 feet. The heron was perched on a branch a few feet away while the gallinule stood on the nest, pecking at an egg. It presently hopped down onto a spatterdock leaf with the egg, cracked partly across the middle, hung on its lower mandible. It dropped the egg and proceeded to eat, or drink, the contents, which dripped from its bill when it raised its head to swallow.

Made uneasy by our nearness, the gallinule presently hooked up the egg again and walked off across the spatterdock leaves, stopping now and then to put the egg down and take another drink. It was like seeing a dainty lady turn cannibal.

Its mate joined it at one point, made a perfunctory peck at the egg and wandered off, apparently uninterested.

On May 8 there were still three eggs in the heron's nest. On May 12, I approached the heron's nest from another direction, between the shore and the button-bushes. While we were still about 30 yards away from it, one of the gallinules sneaked out of the shore grass just ahead of the boat and made off toward it. I located the gallinule's nest, which held five eggs, in the grass, and then followed the bird. When I arrived near the heron's nest, the gallinule was carrying one of the three remaining eggs down onto the same spatterdock leaf that had served as a dining table on May 6. As before, it had cracked the egg part way across the middle, and this time, since incubation was advanced, pulled the contents out in shreds and gulped them down. The heron was sitting quietly a few feet away.

In trying to get into position to take a moving picture I frightened the gallinule, which climbed into a bush whence it kept peering down at the nest. Upon my backing the boat away, it deliberately climbed down to the nest, took another egg, ate a little, and on my moving nearer, hooked it on its lower mandible, carried it to a point a few feet from its own nest and finished eating the contents. I got a brief moving picture of the bird walking with the egg hanging under its chin. I followed and placed the boat close to the gallinule's nest and between it and the bird, which had climbed a bush and sat preening itself within 20 feet of me, seemingly unconcerned at my position in relation to itself and its nest. Presently it made off through the tops of the bushes towards the heron's nest. I followed and was just in time to see it walk down a branch into the nest, carry the last egg down to its dining table and pull out and eat shreds of the embryo. As on previous occasions, the heron sat within a few feet, looking on, apparently cowed.

It seems strange that having tasted blood on May 6, the gallinule did not again molest the three remaining eggs until May 12, and I consider myself lucky to have been a witness on both occasions. I have often seen Purple Gallinules when they approached Red-winged Blackbirds' nests, furiously attacked by the owners, but as I had never seen a gallinule actually molesting a nest, I supposed that the Red-wings were merely objecting to the proximity of birds so much larger than themselves. Now, however, I suspect that the gallinules may, sometimes at least, give the Red-wings cause to fear for the safety of their eggs.

On May 14 I again visited the gallinule's nest. It was partly crushed and the eggs gone. For the sake of poetic justice I would like to be able to consider this as an act of vengeance on the part of the heron, but the evidence points to it being the work of a water snake.—H. L. Beadel, *Tallahassee, Florida.*

A 16-year-old Marsh Hawk.—On July 1, 1928, in Harding Township, Lucas County, I banded a brood of four Marsh Hawks (*Circus cyaneus hudsonius*). On November 14, 1944, one of these, a male bearing band 656303, was shot by Mr. H. O. Thompson of Wallaceburg, Ontario, while it was attempting to catch a pheasant near that city. This was 16 years, four months and 14 days from the date of banding, and the hawk was probably two weeks old at that time. The hawk was mounted and given to one of the Wallaceburg schools. The band itself showed signs of wear on the inside but none on the outside. Previous to this record, my longest-lived Marsh Hawk was banded June 22, 1932, in Spencer Township, Lucas County, and shot December 14, 1937, at Walnut Ridge, Arkansas, by Ezra Moore, five years and five months later. This bird was number B-621403.—Louis W. Campbell, *4531 Walker Ave., Toledo, Ohio.*

Some Observations of birds eating salt.—A note in The Auk of May, 1945 (vol. 62: 455), by John B. Calhoun, describes an incident of English Sparrows eating salt from a block in a barnyard in Indiana. In the course of wildlife studies in Rocky Mountain National Park, Colorado, in 1939 and 1940, I observed a number of species of wild birds pecking salt blocks that had been placed on the range for the benefit of bighorn sheep. Blocks of pure NaCl and other blocks made up of a combination of other salts, such as calcium, phosphorus, magnesium, and the like, were used. While birds were seen pecking at both types of block, their preference appeared to be for the sodium salt. Band-tailed Pigeon (*Columba f. fasciata*) and American Magpies (*Pica pica hudsonia*) visited the blocks quite frequently. Other species observed obtaining salt included Western Mourning Dove (*Zenaidura macroura marginella*), Lewis's Woodpecker (*Asyndesmus lewis*), Batchelder's Woodpecker (*Dryobates pubescens leucurus*), Long-crested Jay (*Cyanocitta stelleri diademata*), Rocky Mountain Nuthatch (*Sitta carolinensis nelsoni*) and Rock Wren (*Salpinctes o. obsoletus*). These and some other birds were quite often seen obtaining gravel near salt blocks, and one spot where blocks had been placed for several years so that the soil had become impregnated with salt, appeared to be especially favored for this purpose.—Lt. Fred Mallery Packard, U.S.N.R., *34 Randolph Street, Passaic, New Jersey.*

English Sparrow eating salt.—On page 455 of The Auk for July, 1945, Mr. John B. Calhoun has drawn attention to the above curious habit of the English Sparrow. If Mr. Calhoun will refer to an article of mine in The Auk for October, 1921, p. 606, he will find that I not only gave an account of some Purple Finches at Hatley, P. Q., that were addicted to this same habit, but also drew attention to a reference in 'Bird-lore' (22: 286, 1920) to House Finches (*Carpodacus mexicanus frontalis*) that were similarly addicted. It has also been recorded in the March-April number of this same magazine for 1921, pp. 90–91, how English Sparrows, Mourning Doves, Crows, and some other common birds have been seen around a trough in a pasture apparently picking up grains of salt. Chickens are also said to eat is greedily. Like Mr. Calhoun, I am unable to offer an explanation for the physiological need of such large quantities of salt.—H. Mousley, *4073 Tupper St., Montreal, P. Q.*

Mortality notes on the Trumpeter Swan.—On March 16, 1945, while on an army maneuver in British Columbia, Canada, I found remains of a Trumpeter Swan (*Cygnus buccinator*), on the Bella Coola River, one-half mile west of Stuie. Feathers were strewn over a thirty-yard-square area on a sandbar at the edge of the river. Positive identification was made by the presence of the trachea and the enlarged tracheal bulla in the skeletal remains. Coyote tracks were observed on the sandbar and the bird could have been taken by this predator as it fed along the banks of the narrow river. However, local residents claim that eagles will occasionally knock a swan down in mid-air and wound it, but never recover the bird. The coyote may have made the kill under these conditions.

Exact date of the killing is unknown, but it is assumed to have occurred in midwinter. A census of Trumpeter Swans in February, 1945, at Tweedsmuir Park, adjacent to Stuie, showed 134 birds wintering in that area. The birds are in this country from November to March or April, and many are concentrated on Lonesome Lake near the southern tip of the park. During winter, when the lake is frozen, they often rest on the ice and feed at the lake inlet and along near-by open streams.

This is the third British Columbia record of a dead Trumpeter Swan in 1945. The first was that of a bird which had died of lead poisoning; a pathological examination of the second showed that death was due to intestinal parasites. Records of the British Columbia Game Commission indicate that the coyote is the greatest predator of the Trumpeter Swan. Horned Owls preying on juvenile birds cause the next largest number of mortalities, while the Golden Eagle ranks third. Local residents say the eagle is the worst predator. However, in this area the slower-flying Bald Eagle is more numerous than the Golden Eagle and its kills are probably fewer than those made by the coyote.—CARL R. EKLUND, *Captain, Arctic Desert Tropic Branch, Air Forces Center, Orlando, Florida.*

Occurrence of the Hudsonian Curlew on National Wildlife Refuges along the Atlantic Coast.—The distribution along the Atlantic Coast of National Wildlife Refuges, the majority of which have been established in the past ten years, gives their personnel an unusually good opportunity for observing the flight of the Hudsonian Curlew (*Numenius phaeopus hudsonicus*). The species has been reported from seven coastal refuges in six states from Massachusetts to Georgia. A résumé of data submitted by the refuge managers is here presented; the Brigantine and Cape Romain National Wildlife Refuges would appear to be important concentration points for the species.

Parker River Refuge, Plum Island Unit, Essex County, Massachusetts.

The first record of this curlew on the refuge following its establishment in December, 1942, was obtained in the summer of 1943. By July 21 the birds frequently were heard calling over the refuge marshes, J. S. Gashwiler reported, and three flocks were seen by him passing high overhead on August 5. The same observer estimated that 200 of these birds visited the refuge in their southern migration in 1943. Not more than 100 were seen by Mr. Gashwiler during the fall of 1944, with the first migrant observed July 20, and the last stragglers noted September 16. According to Charles Safford, of the Anna H. Brown Sanctuary, Plum Island, peak migration dates for curlews in this vicinity are August 3, 4, and 5, regardless of the weather.

Brigantine Refuge, Atlantic County, New Jersey.

This refuge was established in October, 1939. The first migrating curlews seen were 50 birds reported by W. P. Schaefer on May 13, 1940. Fall migrants were first noted by this observer on July 31, 1940; the peak was reached when 107 birds were observed on August 8; no curlews were seen after August 20. Albert Stadlmeir stated that the first migrants to reach the refuge in the spring of 1942 were 25 birds on April 18. Peak numbers occurred on May 10 when about a thousand curlews were seen, and the last observation that season was of five hundred birds, May 16. Numbers were less in 1943; the earliest observation was made on April 9 when 20 birds were counted; and 150 birds noted on April 30 proved to be the last of the season. Fall migrants numbering about 400 appeared on July 15, 1943, and the maximum number seen in a single day was 1,500, on August 15. Last noted were 200 birds, August 31. An estimated total of 5,000 curlews used the refuge in their 1943 fall flight, according to Mr. Stadlmeir. His first observation of this species the next spring was of 50 birds on April 5; the largest number seen was 500 birds, April 25, with 100 being the last seen April 29. The manager estimated that 600 birds used the area during this flight. In the fall of 1944, approximately 5,500 birds stopped on the area. First seen were 75

on July 6; a peak of 1,500 was reached August 10; and the last observation of the season was of 20 birds, September 15. The manager estimated that 3,000 curlews had passed through the refuge in their northern migration by the end of April, 1945. The first flock, numbering 50 birds, was seen March 25 and 400 curlews were present on April 10.

Chincoteague Refuge, Accomac County, Virginia.

Established in 1943, this refuge was under intermittent administration until the spring of 1945. In the spring migration of 1943, E. R. Clark noted that approximately 25 birds had used the area by the end of April. The first migrants were noted on April 30 when four birds appeared. Occasional individuals were seen in the late summer and fall of that year. J. H. Buckalew recorded 27 birds near the old Lighthouse Station, April 14, 1944, and a fair migration occurred that spring. This same observer saw 25 curlews on April 4, 1945, and estimated that some 500 birds had passed through the refuge by the end of the month.

Back Bay Refuge, Princess County, Virginia.

The Hudsonian Curlew has been reported by refuge personnel as a regular migrant through the area since the establishment of the refuge in 1938. The first migrants in 1940 were recorded by H. A. Bailey on April 17; he saw a large number of curlews moving northward during the week of April 27; and the migration was still on during the week of May 4. Larger numbers were noted by this observer in the spring of 1941. Refuge Manager Jack E. Perkins observed that the peak of curlew migration was reached in May, 1943, and recorded the species as abundant along the ocean shore in the fall of that year. His only record the following spring was of two birds seen April 30, 1944. The curlew continued scarce in 1944 and 1945; one bird was seen on April 12, 1945.

Pea Island Refuge, Dare County, North Carolina.

Seen as a spring and late summer migrant, the Hudsonian Curlew has never been reported in any numbers from this refuge, which was established in 1938. Former Refuge Manager, A. S. Walker, states that five birds were seen by him on April 27, 1937, and 20 on May 3, 1937, the year preceding formal establishment of the refuge. Twenty-five were present on April 25, 1940, and a small flight occurred that fall with peak numbers noted August 10. The first spring migrant in 1941 was seen on April 28 and only occasional birds were observed that year. No observations were recorded for 1942. The species was scarce in 1943, and the only record made was that of two birds on April 21. Mr. Walker reported four curlews on May 24, 1944, and estimated that not more than 25 used the area that year.

Cape Romain Refuge, Charleston County, South Carolina.

Although scattered individuals may be seen on the refuge any time during the year, the largest numbers are noted during May and August. Neil Hotchkiss, who visited the area on May 23, 1930—two years before its establishment as a refuge—reported 30 to 50 curlews on Raccoon Key, and noted that the species appeared rather numerous toward McClellansville. A flock of 1,000 curlews was recorded on Cape Island, February 24, 1936, by the manager, A. H. DuPre. Good flights occurred also on April 18 and May 22. The total for the season was estimated at some 5,000 birds. In 1937 Mr. DuPre reported approximately 5,500 birds in the spring migration. Large numbers were noted also that fall, and by

July 17 the species was more numerous than it had yet been noted at that time of the year. Little change was apparent in 1938; the first migrants were seen March 30, and an estimated 5,000 were present on May 3. Mr. DuPre reported the species as plentiful by July 30, 1938, as the fall migration got under way. The spring flights of 1939 and 1940 were smaller but large numbers of the birds were seen in the fall of 1940. In 1941 the spring migration was stronger than in the previous two years and the fall flight was considered normal. The northward movement through the refuge in 1942 was slow, but by the latter part of July, fair numbers of curlews were resting on the refuge during their southern migration. Again, in 1943, the species was late in coming to the refuge and few birds were seen in April. However, by the end of May, Mr. DuPre reported that curlews were considerably more abundant than they had been in several years; the flight that fall was fair. Due to personnel changes resulting from the war, observations in 1944 were less regular. William P. Baldwin noted a flock of 60 birds passing through the refuge on May 24, 1944, saw individual curlews on several occasions during the summer, and recorded a flock of 15 on August 8.

Blackbeard Island Refuge, McIntosh County, Georgia.

Records of the occurrence of the Hudsonian Curlew on this refuge date from 1941 when Refuge Manager Oscar Goodwin noted a flock of six birds, April 20. Dr. E. P. Creaser reported that the species was seen quite regularly during the months of November and December, 1941. Flocks of 75 to 300 were present during May, 1942, along the tidal flats, according to Refuge Manager, Joe Morton, and 200 were seen by him in December. The species appeared to be more numerous the following spring, and it was estimated that a thousand birds were on the refuge by the end of April, 1943. Mr. Morton recorded the first fall migrants on September 15 when 100 birds were counted; the last observation that season was 300, December 22, 1943. Fewer numbers were seen in 1944 when Refuge Manager, E. S. Jaycocks, estimated that approximately 600 birds used the refuge.—FAXON W. COOK, *Fish and Wildlife Service, Department of the Interior, Chicago 54, Illinois.*

Status of the Upland Plover in Lancaster County, Pa.—The ninth census of the Upland Plover (*Bartramia longicauda*) in northern Lancaster County, Pa., was taken under the most adverse agricultural conditions thus far met with in the plan. During all of July, 1945, with the exception of four or five days, there had been rain. Sixty per cent of the wheat, usually harvested the first week in July, was still drooping on the fields on August 8. Much clover and grass was still uncut and weeds, mostly chicory and Queen Anne's lace, covered tract 'B,' the Lancaster Municipal Airport, which is the favorite breeding and feeding ground of the Upland Plover in Lancaster County today. The low wheat stubble and grass fields, where the birds were found before, were almost entirely absent over the four tracts this year. Most probably for these reasons the count was less than a third of the high mark of 1941. The birds were probably scattered over more favorable feeding grounds. Some of them may have started their long journey through Texas toward Uruguay and Argentina two or three weeks ahead of time. Invariably, all have left Lancaster County by September 1.

The tracts charted in 1921, known to the writer to have been the best places for plover shooting prior to 1913, when the species was taken off the list of game birds, were covered, as usual, by well-qualified observers. These tracts are widely separated, from one and a half to two square miles each, in four different townships.

The nine census records are as follows:

Tract	A	B	C	D	Total
1921 (Aug. 4)	12	3	3	3	21
1922 (Aug. 3)	8	9	1	4	22
1923 (Aug. 9)	23	36	1	18	78
1925 (Aug. 8)	1	3	0	1	5
1936 (Aug. 4)	5	22	4	11	42
1937 (Aug. 4)	11	28	1	17	57
1939 (Aug. 3)	14	75	0	5	94
1941 (Aug. 4)	94	65	0	2	161
1945 (Aug. 8)	5	28	12	2	47

The writer's diary of field sports, kept since 1885 (which tells of seeing about 125 Passenger Pigeons in near-by York County in 1888) records that there were at least 300 Upland Plovers on a tract of about a square mile in northern Lancaster County, July 25, 1895. It also records that Frank Thurlow and the writer shot 20 plovers on Tract 'D', July 16, 1906. There were certainly more than 150 plovers there that day.—Herbert H. Beck, assisted by Frank Thurlow, Barton Sharp, George Pennypacker, Lt. Robert Snyder, and Charles Regennas, *Franklin and Marshall College, Lancaster, Pa.*

An unusual site for the nest of Swainson's Warbler.—On the morning of May 14, 1945, while nest hunting in the woods near the Kanawha City section of Charleston, W. Va., I found the nest of a Swainson's Warbler. My method was to scrutinize carefully any bunch of grass or dead leaves which might conceal some eggs, and it was when I reached for just such a bundle of leaves that a small brown bird left the nest. She did not return, so it was not until May 20, when I again visited the nest with several other club members, that I was certain this was a Swainson's Warbler's nest. On this date, as on May 14, there were the four unmarked white eggs, which seem rather large for a small warbler. Again the parent bird used the same tactics to escape detection, dropping directly to the ground and quickly disappearing. However, she would not leave the nest until I reached directly toward it.

My next visit was on May 27, and this time three young birds were lying limply together, completely covering one unhatched egg. Later in the day, Mrs. J. W. Handlan reported seeing both adults approach with food, but neither would go to the young so long as they were being observed. On Memorial Day the nest was visited by Alston Shields who found the situation unchanged, but on June 4 the nest was empty and the unhatched egg (which I am keeping) had fallen to the ground intact. After this date the young birds were not seen again but the male continued singing from his usual perch.

The actual site of the nest was about 30 yards from the road which leads through Donnally Hollow to the small dams known as Twin Lakes. It was placed in a spice bush about six feet from the ground and very cleverly concealed. The nest was constructed of coarse grasses and dried leaves outside, with finer grasses for lining, and was approximately half the size of a Wood Thrush's nest.

Several members of the local bird club have visited the site of what is the first nest of this species to be discovered in West Virginia.—Eleanor Sims, *Charleston, West Virginia.*

Unusual nesting site of Magnolia Warbler.—Since Dr. S. Charles Kendeigh, in his interesting paper, 'Community Selection by Birds,' in The Auk for July,

1945, p. 425, has referred to a photograph of mine in The Auk for April, 1924, plate 20, that depicts a nest of the Magnolia Warbler (*Dendroica magnolia*) built in the forks of a small spiraea bush at Hatley, P. Q., on June 16, 1922, it may not seem out of place to draw attention to two more nests of this warbler found by me near Montreal on June 17, 1942, that were also built in the forks of two small spiraea bushes about four feet above the ground. During the twenty years intervening between 1922 and 1942, I have found many nests of this warbler but all of them were saddled on the upper side of branches of coniferous trees, principally spruce (as is usual) until I came upon these two nests in the forks of spiraea bushes. The first contained three Cowbird eggs but none of the owner, although what had become of these latter I am unable to say. The nest was very small compared with the other and the three Cowbird eggs (possibly laid by the same bird as they look very much alike) nearly filled it. The second nest contained two Cowbird eggs and three of the owner. One of the Cowbird eggs was accidentally badly broken and could not be replaced when photographs of both nests were taken to show the eggs and general surroundings. Both nests were among low second-growth trees and shrubs in open situations.

There is a reference in Macoun's 'Catalogue of Canadian Birds,' p. 637, 1909, to a nest that had been found by the Rev. C. J. Young on July 1, 1895, built in a spiraea bush among small pines and hemlocks, near Otly Lake, Lanark Co., Ontario. It is not specifically stated that it was placed in the forks of the branches, but it may possibly have been like my four, two at Hatley and the two at Montreal. In conclusion, I might mention that of the large number of nests of this warbler that I have found, only the above two and one at Hatley (on June 30, 1915) have contained eggs of the Cowbird.—H. Mousley, *4073 Tupper St., Montreal, P. Q.*

Unusual nesting of two birds in South Carolina.—Through the kindness of a correspondent, the following unusual nesting of the Eastern Kingbird (*Tyrannus tyrannus tyrannus*) was made known to me recently. It seems worthy of record for, not only is it completely new in my lifetime of experience with the bird, but it is probably one of the few departures from custom for this species if, indeed, there are any more!

In July, 1945, a nest was found in a gourd, set up for a martin house on the place of Mr. R. A. Thomas of Smoaks, South Carolina. The custom of erecting gourds for the Purple Martin (*Progne subis*) is a very old one in many parts of the south, and Mr. Thomas makes a practice of it. He states that he usually has a pair of Kingbirds about the place and had not been able to find the nest this season. When he mentioned this to his boys, they informed him that the Kingbirds had built in one of the martin gourds. Hardly crediting it, he went out to see, and saw the old birds coming in and feeding the young which were well advanced in growth. They left the nest "about July 25." The dates of the building, egg laying, etc., he does not have. The writer is not now situated where an examination of the literature is possible to be certain that this occurrence is unique.[1]

The writer is indebted to Prof. Franklin Sherman of Clemson College, S. C., for information regarding what appears to be a unique nesting record for the Eastern Bluebird (*Sialia sialis sialis*). Coming at a time when an extraordinary nesting of the Eastern Kingbird (*Tyrannus tyrannus tyrannus*) had just been made known

[1] A similar case, also from South Carolina, was reported to Mr. Bent who published it in his account of the Eastern Kingbird (U. S. Nat. Mus., Bull. 179: 17, 1942).—Ed.

from the same state, it seems really astonishing that these two, which seem to completely reverse usual procedure, should have occurred in the same state at the same time!

On July 20, 1945, Prof. C. L. Epting of Clemson College found the nest of a Bluebird "saddled on the horizontal limb of an oak tree" on the Clemson campus. It was new to him and he called Prof. Sherman's attention to it. The latter visited the site that afternoon and the next morning (July 21). He saw the female make two visits to the nest in the afternoon and "feed the clamoring young" and this was repeated the next morning. The nest was between 12 and 15 feet from the ground, about 15 feet out from the trunk of the tree, and the limb overhung a much-frequented street. The limb itself is about 1¼ inches in diameter where the nest is built.

This is the first instance of which the writer has ever heard when a Bluebird did not use a cavity, either natural or otherwise, for its nest. Indeed, some ornithological works state that the species is "dependent upon" such locations. It is an extraordinary occurrence.

Referring once more to the Eastern Kingbird's abnormal nesting in which this species bred in a martin-box near Smoaks, S. C., in July, 1945, we have, in it, a bird with normally exposed nest using an inclosed space, whereas in the Bluebird, we have a species normally nesting in an inclosed space, using a perfectly open situation! No explanation of either of these reversals of custom occurs to the writer.—Alexander Sprunt, Jr., *The Crescent, Charleston 50, South Carolina.*

A nesting record for the Golden Pileolated Warbler.—The Golden Pileolated Warbler (*Wilsonia pusilla chryseola*) is a fairly common summer resident of western Oregon but the nest of this species has been reported only once before (Gabrielson and Jewett, Birds of Oregon, 1st ed.: 517, 1940). On July 20, 1945, in company with my son, I discovered a nest of this subspecies on the shores of Hidden Lake on the southwestern slope of Mt. Hood at an elevation of about 4,000 feet. The nest was about eight inches above the ground, deep in a clump of squaw grass (*Xerophyllum tenax*) located on a rocky slope about twenty feet above the water surface of the lake. It contained four eggs and was composed of a brown material resembling the shredded inner bark of red cedar. The female was flushed from the nest and remained in the close vicinity while we examined the nest and observed her with binoculars. A mountain alder thicket at the upper end of this small lake seemed to be a desirable habitat for this subspecies as a number of these birds were observed there within a small area.—Norbert Leupold, *Portland, Oregon.*

Nesting of Eastern Purple Finch in Randolph County, West Virginia.—The first definite breeding records for the Eastern Purple Finch (*Carpodacus p. purpureus*) in West Virginia were made near Cheat Bridge, Randolph County, on June 12, 1945. On this date three nests, all under construction, were found. Two were in red spruce, *Picea rubra*, and one was in balsam fir, *Abies balsamea*. Two were placed on small branches against the trunks about four feet from the top of 40-foot trees. The third was located on a horizontal limb at a height of 25 feet. All three nests were within 200 yards of Cheat Lodge at an elevation of 3,600 feet. A fourth pair of breeding birds was noted in the same area, but the nest was not found. On July 18, one of the completed nests was obtained for detailed examination. The framework is largely of small twigs of dead spruce with scattered St. John's wort (*Hypericum*). The lining is rather compact and made up largely of dead grass

and fibers, with scattered hair, a few lichens, feathers, and thread. The nest has the appearance of having been well used, indicating that a brood of young was successfully reared.—W. R. DEGARMO AND WILLIAM F. STRUNK, *Conservation Commission of West Virginia, Charleston, W. Va.*

An unusual bird fatality (*Plate 3, left fig.*).—About November 15, 1944, the cormorant (*Phalacrocorax auritus* subsp.?), shown in the accompanying photograph, met an unusual death. The bird was first pointed out to me by Mr. C. Hoyt Mills of McClellanville, South Carolina, while we were on boat patrol of the Cape Romain National Wildlife Refuge, Charleston County, S. C. Although dead when examined, the cormorant apparently had attempted to alight on the top of a slender, split pole, had slipped downward, and had been garroted when its neck lodged in the narrowing crack. The pole, formerly supporting a flag marker, was nailed to an engineering survey sign possessing the usual row of close-set nails placed to prevent bird roosting and its results. If the sign had not been so armed the bird might not have attempted to land on such a slender pole as that above the sign. The split at the top of the pole was 2½ inches wide, narrowing down gradually for about three feet. It was first thought that someone in a jesting mood had placed the bird in position but examination discounted this theory. The spot was a good distance away from the Intracoastal Canal, the sign had been established many months or even years previously, the isolated post was difficult to approach over the very boggy salt marsh, and the bird was ten feet above the level of the marsh muck. During five years' residence at the refuge, this has been the only example of this type of bird death the writer has witnessed.—WILLIAM P. BALDWIN, *Cape Romain National Wildlife Refuge, McClellanville, South Carolina.*

Brewster's Booby in Arizona (*Plate 3, upper right fig.*).—An immature *Sula leucogaster brewsteri* was observed in the Bill Williams arm of Havasu Lake, Havasu Lake National Wildlife Refuge, in Mohave and Yuma counties, Arizona, on August 13 and 14, 1943. As usual with boobies, it was an unwary bird and permitted sufficiently close approach to allow me to study all details and even secure a satisfactory photograph of the bird resting on the water. The record is noteworthy not alone because it is the first record of any booby for the State of Arizona, but very probably the first record for the United States of the subspecies *Sula leucogaster brewsteri* (Peters, Check-list of Birds of the World).

Characters apparent in the photograph, as well as from my field description of the bird, are diagnostic enough to permit positive identification as to species. Its straight, sharp, wedge-shaped beak was of the same color—a light bluish-gray, mostly on the gray side—as the naked area about the eye, of which it seemed to be a continuation. The bird's general color was a darkish brown, a little rusty, with some vermiculations, especially on the breast. When resting on the water, its wing tips projected beyond the tail. When it flew, long and narrow wings were immediately noticeable, as well as its pale yellowish feet, the whitish strip on the under side of the wing, and the rather short and rounded tail.

My thanks are due to Dr. Alden H. Miller of the Museum of Vertebrate Zoology, Berkeley, California, who examined the photograph and supplied me with various taxonomic information.—GALE MONSON, *Fish and Wildlife Service, Needles, Calif.*

Laughing Gull robs Brown Pelican (*Plate 3, lower right fig.*).—A recent conversation with Mr. Jack DuPre of McClellanville, South Carolina, in which he told

(*Left*), BALDWIN—AN UNUSUAL BIRD FATALITY. (*Upper right*), MONSON—BREWSTER'S BOOBY IN ARIZONA. (*Lower right*), BALDWIN—LAUGHING GULL ROBS BROWN PELICAN.

of seeing gulls alight on the heads of fishing pelicans in Panamanian waters and rob the latter of their catch of fish, reminded the writer of similar behavior observed at the Cape Romain National Wildlife Refuge, Charleston County, South Carolina, in the summers of 1939 and 1940. A picture of the act was secured with an inexpensive telephoto lens from quite a distance and, although not particularly clear, the photograph is thought to be of sufficient interest to warrant publication.

This refuge has what is probably the northernmost Atlantic Coast nesting colony of the Eastern Brown Pelican (*Pelecanus occidentalis occidentalis*), and during the breeding season the birds fly over extensive areas of salt creeks, bays, and ocean in search of food for their young. Approximately 95 per cent of the food they bring in is menhaden. Their method of diving from the air for fish is too well known to be described here. In the early summer it is not unusual to see Laughing Gulls (*Larus atricilla*), in both breeding and non-breeding plumage, following the pelicans, with as many as five gulls often harassing a single pelican. Just after the pelican has completed the plunge and before it can swallow the fish protruding from its bill, a gull may flutter in, alight on the water or even on the pelican's head and seize the fish. A pelican has never been observed to show anything but stoic calm during this procedure.—WILLIAM P. BALDWIN, *Cape Romain National Wildlife Refuge, McClellanville, South Carolina.*

Great Blue Heron swallows large snake.—On October 28, 1944, as Donald J. Nicholson, Wray Nicholson, Joseph C. Howell, Jr., B. F. McCamey and I were driving eastward along the road between Titusville and Titusville Beach, across the peninsula just north of Merritt Island in Brevard County, Florida, we chanced to see an adult Great Blue Heron (*Ardea herodias*), with head hanging awkwardly forward, standing several rods north of the highway at the edge of a salt-water marsh. When we stopped the car, the bird lifted its head and we saw that it had half swallowed a thick-bodied snake about three and a half feet long. With convulsive movements of its neck and body, the heron succeeded in swallowing several more inches of the snake, then flew laboriously to another arm of the marsh fifty yards away. I believe the heron had killed the snake; but it might have found the reptile dead along the highway and carried it to one side to finish swallowing it. The snake was dark above and white, or almost white, below. It almost certainly was a water snake (*Natrix*) rather than a moccasin (*Agkistrodon*), since the latter is more or less heavily mottled with gray below.—GEORGE MIKSCH SUTTON, *ADT Branch, AAF Center, Orlando, Florida.*

Some Louisiana observations.—While stationed at the Army Air Field near Lake Charles, Calcasieu Parish, Louisiana, from January 1 to mid-June, 1943, the writer had several opportunities to observe the bird life of the vicinity, and through the courtesy of several members of the Fish and Wildlife Service personnel in that Gulf Coast area, notably Mr. John J. Lynch, was enabled to visit the Lacassine and Sabine refuges of the Service in Cameron Parish. After comparison of roll calls and journal entries for this period with H. C. Oberholser's 'The Bird Life of Louisiana' (1938), the following observations seem worthy of record:

WHITE-FACED GLOSSY IBIS, *Plegadis mexicana.*—On April 27, scores of individuals among some four hundred ibises present on the Lacassine Refuge marshes were satisfactorily identified as of this species. I stalked the first group patiently, through mud and stubble, in order to check facial markings but subsequently had several small groups fly close enough to be readily identified. None of the ibises observed at sufficiently close range lacked this specific field characteristic.

GULL-BILLED TERN, *Gelochelidon nilotica aranea*.—Among the first birds to excite my curiosity after arriving at Lake Charles was a flock of terns and gulls feeding and resting in a wet meadow at one end of the air field. Although first noticed on the 3rd, it was not until January 16 that I found a way of examining these birds closely. The meadow bore a growth of close-cropped rushes and was marked by flat furrows bespeaking recent cultivation. The raised path of an old sand road cut across it but to either side were pools with an inch or two of water spotted by many hive-like mounds of the crayfish. Along with a few Herring and Ring-billed Gulls, there were fourteen Gull-billed Terns resting on the sandy ridge of the road or flying about. Although heretofore unfamiliar with this species in life, I offer this sight record with full confidence for, with Peterson's 'Field Guide' in hand, I carefully double-checked all field marks. Almost all these terns showed the black ear patch, a remnant of the summer cap, either prominently or as a grayish vestige. One bird hovering directly over me, evidently doing some reciprocal observing, uttered a high, dry-toned treble call, *kik kik kik*. Another was marred by oil-soaked under plumage.

It was especially interesting to see that they were feeding on crayfish here, a performance as graceful and quick as the swoop of any maritime tern after a small fish at the surface. I saw them thus snatch up three or four crayfish, and though I could not tell whether these were actually taken from the mound opening itself (the vegetation was just high enough to prevent close scrutiny), I have no doubt that these crustaceans were their prey since they could be seen curling and uncurling their 'fringed' abdominal portion before being swallowed on the wing by their agile captors.

The flock disappeared the day after the record minimum temperature of 22° F. experienced in southern Louisiana on January 19, perhaps because this frost killed the crayfish in their burrows, though I did not have time to check this. I report this observation in detail because Oberholser calls this tern a "rare permanent resident" coastwise and records no such inland occurrence as given here, and because the habit of feeding on crayfish appears to be an uncommon one if not unrecorded.

WESTERN BURROWING OWL, *Speotyto cunicularia hypugaea*.—On January 31, I had the pleasant experience of flushing this small owl from under the edge of temporarily empty barracks set above the ground on concrete pillars. It flew quickly, low over the ground, but soon settled again, turning sharply in alighting, and it stood high on its long legs and watched me closely, all characteristic behavior. Although reports indicated the presence of numbers of individuals at points farther east along the coast, this was the only one I saw in western coastal Louisiana.

BROWN-HEADED NUTHATCH, *Sitta p. pusilla*.—On April 12, I saw a pair in a grove of long-leaf pine at Mallard Junction, just east of Lake Charles. A strong wind made observation difficult but, returning to the same locality in mid-May, I again found a pair, presumably the same, this time carrying food and showing attachment to a small cluster of high pines. Although my efforts to locate a nest cavity were unrewarded, it seemed evident that this was a nesting pair.

LOGGERHEAD SHRIKE, *Lanius l. ludovicianus*.—A family group of three young and the two parents was observed closely in the shrubbery outside the air-field gate on April 27. The fledglings were still hesitant in flight and had probably been off the nest only two or three days. Assuming an incubation period of 13 days and an altricial period of about 20 days, this observation would antedate by

over a month the record egg-laying date of April 16 listed for this species by Oberholser. I have assumed the subspecific identity of these birds on the basis of the tentative range designations given by Oberholser.—ROLAND C. CLEMENT, *49 Tremont St., Fall River, Massachusetts.*

Mockingbird at Bonaventure Island, Quebec.—During a recent ornithological field trip to the Gaspé coast, Quebec, Canada, a Mockingbird was observed on Bonaventure Island, at Percé, on June 26, 27, and 28, 1945. Although I did not see the bird myself, being elsewhere at the time, the single individual was studied by Dr. Robert Lockwood and Dr. Stephen Langfeld, both competent observers. I believe this to be the farthest northern occurrence of this species and therefore worthy of permanent record.[1]—DELOS E. CULVER, *'Addingham,' Drexel Hill, Penna.*

New records for the Puerto Rican avifauna.—An adult male of the Scarlet Tanager (*Piranga olivacea*) was collected on May 3, 1944, on the coastal plain of the southern coast of Mona Island. This record is very interesting because the bird has not been reported either from Puerto Rico or Hispaniola. The individual was seen frequenting a small patch on the coastal plain densely covered with "cogollo" palm (*Sabal causiarum*), growing on the southern littoral of Mona Island. The bird was seen alone and in spite of my efforts I did not succeed in finding more individuals during the next ten days. The species winters in Venezuela, Colombia, British Guiana, and south to Brazil, Perú, and Bolivia. Is a rare winter visitor in the West Indies where accidental occurrences have been recorded from Jamaica, some of the Virgin Islands, the Lesser Antilles, and the Bahamas. Examination of stomach contents showed nothing but remains of the fruit of "papayo" trees (*Metopium toxiferum*) which grow abundantly on the coastal plain of Mona. The bird was in its magnificent scarlet plumage typical of the season.

On May 4, 1944, one female and two males of the White-winged Dove (*Zenaida asiatica asiatica*) were collected at Ubero Beach, on the southern coast of Mona Island. On this occasion I noticed the presence of this species for the first time on the island. A small flock of about 30 individuals was observed feeding in a dry, cactus-covered area close to the sandy beach. The birds remained in Mona until about the first days of June, as on my next trip to the island (June 7) I succeeded in obtaining only one more female. The rest of the flock recorded on May 4 probably continued its interrupted journey to the southwestern littoral of Puerto Rico.

Another female of *Zenaida asiatica asiatica* was secured on August 19, 1943, in the vicinity of Boquerón, Puerto Rico, a very dry region in that neighborhood. The presence of this dove in Puerto Rico dates back many years according to the testimony of many local hunters, but I obtained positive evidence in August, 1943. I noticed that it frequents only the extreme southwestern corner of Puerto Rico, in the area enclosed between Boquerón and Guánica. These doves are found associated in flocks of about 25 to 30 individuals during the months of July, August and September. During this period they are pursued by hunters as a game bird.

On December 15, 1943, three Mallard Ducks (*Anas platyrhynchos platyrhynchos*) were killed from a flock of eight birds on the opening day of the duck season at Anegado Lagoon (Lajas) by Mr. Sadoth Morales, a local sportsman and hunter.

[1] There are earlier records from Anticosti and "Godhaut" (?Godbout), noted by Wright, Auk, 38: 481, 1921.—ED.

I hoped to preserve one as a specimen for the record of the occurrence of the Mallard in Puerto Rico, but did not succeed because they were skinned before I could reach his place.—VENTURA BARNÉS, JR., *Division of Fisheries and Wildlife Conservation, Department of Agriculture and Commerce, Mayagüez, Puerto Rico.*

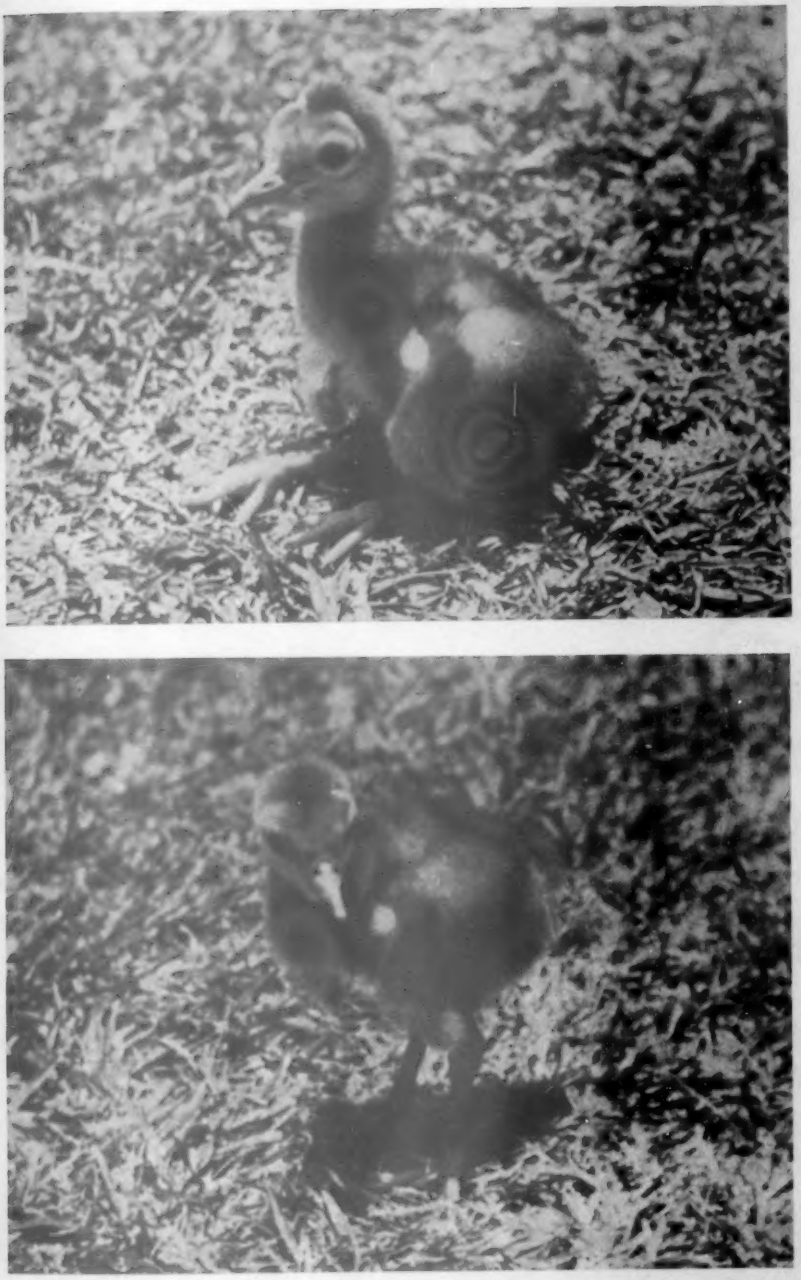
Swainson's Hawk in Massachusetts.—There are half a dozen published records of Swainson's Hawk (*Buteo swainsoni*) in the little (but much "birded") Commonwealth of Massachusetts, so far to the eastward of its normal range, besides several others termed "apparent" or "probable." My own experience indicates that the bird may be less unusual—especially in the August-September period when other western species seem likeliest to occur here—than has been thought, for the vast majority of our observers, on seeing one, would give it up as unidentifiable. For instance, on September 13, 1939, at the southern end of the Artichoke reservoirs in West Newbury, I thus "gave up" a hawk which I saw very well: big; mainly a plain, dark, dull brown; with long tail; long, pointed wings not quite extending to tail-tip; behavior of a Marsh Hawk (standing on mud, or perching on a rock in the shallow water) but with no white croupe! Again, on August 23, 1942, I "gave up" a hawk I watched in very low, steady flight at Arcadia Sanctuary in Northampton. Its long wings and very long tail suggested Marsh Hawk, but the flight seemed too regular and again there was no white croupe. It appeared to be dark gray all over.

Now on the same month and day, August 23, in 1945, at Clark's Pond, Ipswich, I spied a big hawk alighting in one of the lonesome trees on the bare hills, and through a telescope made certain it was a Buteo, but a remarkably long-tailed Buteo. It presently flew out of sight behind the western hill. Mr. Ludlow Griscom arrived and was told of it, and four of us in the car of Mr. Richard C. Curtis drove over the hill and flushed the hawk so that we could first look down upon it and later up at it as it gyrated higher and higher and moved away on the easterly breeze. Mr. Griscom, of course, *knew* Swainson's Hawk and pronounced this one an immature in the dark phase, pointing out to us its "sooty" appearance, scarcely lighter below than above; the absence of bars in its long tail (which looked dull tan when the sun shone through it); and the great length of the wing, with blackish tip and a light patch clear across the primaries proximal to this tip but more distal than is the smaller light spot in the primaries of the Red-shouldered Hawk.

Seeing this bird so perfectly enabled me to identify with moral certainty that of September 13, 1939, and with at least probability that of August 23, 1942.—SAMUEL A. ELIOT, JR., *Smith College, Northampton, Massachusetts.*

A baby Florida Sandhill Crane (*Plate 4*).—On May 27, 1945, Capt. and Mrs. Donald B. Lawrence, Wray Nicholson, Lt. B. F. McCamey, and I motored from Orlando south to the Kissimmee Prairie expressly to observe the Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) on its nesting ground. We found a few pairs of these sparrows in open country southwest of Kenansville, Osceola County, heard the males singing their weak songs, and found a nest with four fairly fresh eggs. The most thrilling find of the day was, however, a captive baby Florida Sandhill Crane (*Grus canadensis pratensis*), about two days old, which we saw at a farmhouse near Lake Marion, just north of the Prairie proper.

The beautiful little creature had been taken the day before from a nest on an islet in a shallow pond on the Prairie. It was too young to stand firmly, appeared to be wholly unafraid, and cheeped in a high, fine voice. If put in the strong



SUTTON—A BABY FLORIDA SANDHILL CRANE.

sunlight, it promptly sought shade. It took small grasshoppers from the hand, but did not swallow them very expertly. Given a pan of water, it waded about, sat down and drank deeply, but did not go through the motions of taking a bath. After eating four small grasshoppers, it became drowsy, sank to its belly, and let its head sink farther and farther forward until one side of the face rested on the grass. In this attitude it napped briefly but soundly, with eyes closed.

Standing, it held its head moderately high and let its wings hang limp. On "sitting down" it rested on its heels and lifted its head, or sank to its belly and let its head rest between its shoulders. Its plumage was foxy red-brown, brightest on the back, paler on the face, belly and sides, with a white spot in front of each wing. The forehead and crown were fully feathered. The feet were brownish pink. The basal half of the bill was pinkish flesh color, the terminal half horn gray, the egg-tooth grayish white. The eyelids were dull bluish gray, the irides light gray with a faint greenish or bluish cast, the pupils milky gray rather than black.

On inquiry, we found that the nest had been discovered some time before, and that it had never held more than one egg. Wray Nicholson, who knows Florida birds from a lifetime of experience with them, informed us that Florida Sandhill Crane eggs usually hatch in the early spring, and expressed the opinion that the severe drought of recent months was responsible for the lateness of the nesting of this particular pair. Both half-tone illustrations are from perfectly exposed kodachromes taken by Captain Lawrence. These kodachromes were used in checking my color-notes on the fleshy parts of the young crane.—GEORGE MIKSCH SUTTON, *Major, Air Corps, ADT Branch, Bldg. T-43, AAF Center, Orlando, Florida.*

Northward extension of the summer range of the Limpkin.—The status of *Aramus pictus pictus* outside the state of Florida is usually understood as embracing only that part of southeastern Georgia covered by the Okefenokee Swamp. Casual occurrences are known from South Carolina. However, even in south Georgia it is now a rare species and difficult to find. In the recently published 'Birds of Georgia' (Greene, Stoddard, Tomkins, *et al.*) the authors state on page 36 that it is "rarely found in the southeastern part of the State. Recent records are from the Colerain section in western Camden and eastern Charlton counties where the species appears to be a rare resident."

During an ornithological investigation of parts of the Altamaha River Swamp in Glynn County in May, 1945, the writer, with Mr. E. B. Chamberlain of the Charleston Museum, found a pair of these birds on Altama Plantation. This tract lies on the south bank of the Altamaha, and immediately adjacent to the county line between Glynn and McIntosh counties. It is about eight miles south of Darien and sixteen miles north of Brunswick. The birds were flushed from sawgrass in the midst of a large cypress-gum swamp on the edge of a canal. One of them alighted on a small cypress just across the narrow canal where it stood, jerking its tail and bobbing the head in characteristic fashion. We approached to within about 75 feet. Search was made for the nest as we felt confident the birds must have been breeding (the date was May 22), but we were unsuccessful. A day or two before, at the same spot, we had found a few eggs of the *Pomacea caliginosa*, the fresh-water snail which forms such an important item of diet of this bird. Later, we found live snails. This may be the northern limit of the snail's range and, therefore, that of the Limpkin also. At any rate this is the farthest north by about 100 miles that the species has been found in the breeding season, virtually up to the McIntosh County line which, in this case, was not over a half mile distant.—ALEXANDER SPRUNT, JR., *The Crescent, Charleston 50, S. Carolina.*

The Dickcissel in eastern West Virginia.—On June 2, 1945, Watson M. Perrygo of the United States National Museum found a male Dickcissel (*Spiza americana*) three miles south of Shepherdstown, Jefferson County, in extreme eastern West Virginia. The bird was singing from telephone wires near a clover field. The locality is in the main valley of the Potomac River, approximately 22 miles in an air line from the area near Dickerson, Maryland, where Frederick Lincoln and I found Dickcissels breeding in 1928. The bird was not collected but there is no question as to its identify as Mr. Perrygo is familiar with the species from extensive field work in its usual present-day range in the Mississippi Valley. The record adds another county to the occurrence of this bird as given by Maurice C. Brooks in his recently published 'Check-list of West Virginia Birds' (Agric. Exp. Stat. West Virginia Univ., Bull. 316: 18, 1944).—ALEXANDER WETMORE, *Smithsonian Institution, Washington, D. C.*

A Red Phalarope in Tennessee.—This member of the sandpiper family (*Phalaropus fulicarius*) is predominantly a coastal transient and a maritime species during the winter; therefore an inland occurrence is of especial interest. On December 17, 1944, while the annual Christmas census of the Great Smoky Mountains Park area was being taken, one party of observers discovered a dead bird of this species on the road near the rear of the Park Headquarters building. Mrs. Frank Leonhard of Knoxville first noticed the bird, gray and white of plumage but much soiled and somewhat damaged by passing autos. We found after washing and drying the specimen that it would be possible to preserve it in the form of a study skin. With the aid of Dr. Henry Meyer, the bird was measured with the following results, expressed in inches: wing, 5.00; tail, 2.15; bill, 0.84. Examination and dissection showed that the gizzard was empty except for three small pieces of grit, and that the determination of sex was impossible due to disintegration. The skin was presented to Arthur Stupka, Park Naturalist, and has been deposited with the other park records. Dr. John W. Aldrich of the Fish and Wildlife Service, Washington, D. C., who kindly agreed to examine the specimen, verified our identification of the Red Phalarope.

The occurrence of a bird far from its normal range and habitat can sometimes be due to weather disturbances, and in this instance a logical explanation seems to be the Atlantic hurricane of October 13 to 21. A review of the weather data by Mr. Stupka confirms this suggestion. On the night of October 20–21, the strong winds and heavy rainfall were of sufficient intensity to break off numerous dead limbs, and on the mountain crest along the North Carolina-Tennessee divide there were some patches of sound timber (particularly fir) felled by the blow. The phalarope, brought in and perhaps injured by the storm, wandered about until it died or was killed by a passing auto. Since the road (a gravelled side-road) is infrequently travelled, it is quite possible that the bird could have been overlooked for this period of several weeks. Also, temperatures were low enough the greater part of this time to keep the body of the bird fairly well preserved.

A review of the more recent literature, along with inquiries among local ornithologists, indicates this is the first time the Red Phalarope has been recorded in Tennessee and is likewise the first listing of the bird for the Park area.—W. M. WALKER, *Knoxville, Tennessee.*

Trumpeter Swans in Alaska.—When I visited Ketchikan in 1940, agents of the Alaska Game Commission told me of swans that wintered in that vicinity, but it was not until March, 1944, that I was able to check on this personally. On

March 10, 1944, I flew with Ray Renshaw in an Alaska Game Commission plane over Prince of Wales Island, several smaller islands, and part of the Cleveland Peninsula. During the trip we counted over 300 swans. They looked big and the knowledge that Trumpeters were known to winter in the adjoining Queen Charlotte Islands and on the north end of Vancouver Island made it reasonable to believe they were of that species.

In March, 1945, Dan Ralston, the Wildlife Agent in Ketchikan, made a one-day check from a plane and counted 257 swans on Prince of Wales Island, six on the Cleveland Peninsula, and 61 on Revillagigedo Island, or a total of 324 birds. He knows of about 25 more that winter on the mainland from South Behm Canal to Cape Fox, an area which could not be covered in the survey. This makes a total of about 350 wintering birds in the Territory.

On April 4, 1945, at Ward's Lake, Ralston found a dead swan and forwarded the bones to me for identification. It was a Trumpeter Swan. This seems to settle the question of identity and to increase greatly the total known wintering population of Trumpeter Swans on the Northwest Coast.—Ira N. Gabrielson, *Fish and Wildlife Service, Washington 25, D. C.*

Brown Pelican colony on Cape Romain Refuge increases.—The nesting colony of Brown Pelicans (*Pelecanus occidentalis occidentalis*) found on the Cape Romain National Wildlife Refuge, Charleston County, South Carolina (near the northern limit of the Atlantic Coast breeding range of this species) has shown a continued and satisfactory increase.

For many years the nesting colony has been situated in several sites now in the refuge, the best location having been the tallest dunes at the southern end of Cape Island. In 1943 the birds abandoned these dunes for those on the southern end of the adjacent Raccoon Key, and in 1944 the birds again nested on Raccoon Key. In that year the first spring observation of a pelican on the refuge was made on February 24; by the middle of March the birds were commonly observed.

A nesting site was selected on the tallest dunes. The colony was first visited for close examination on April 20, at which time about 300 adult pelicans were present and egg-laying was well under way. A total of 133 nests had been constructed, of which two contained three eggs, 23 had two eggs each, 25 had one egg, and 83 nests were only partly completed. Three days later, two nests contained the maximum of four eggs. Although the incubation period started between April 20 and 25, egg-laying continued over a long period.

On the twenty-seventh of May, 507 nests were found in the area and by the twenty-third of June, 559 nests had been counted; later counts revealed that a few more nests were built even after this latter date. The nests, of dune grasses, herbaceous plants, and beach drift, were built on the ground in an area of dunes only one-quarter of an acre in extent. Hatching began on or about May 19 and extended to July 26. On that date a count of 575 young birds, still unable to fly, was made. Since the average number of eggs per nest had been three, it was obvious that, even with no losses from human disturbance or tidal action, natural nesting loss was high. The colony was last visited on September 16, at which time there were 25 young still in the flightless stage. Throughout the summer, examinations of food remains about the nesting site indicated that 95 per cent was menhaden (*Brevoortia*) and five per cent was mullet (*Mugil*) and other species.

Although the largest number of adults observed together at the nesting colony was 750, the nest count indicated that at least 1,120 were in the vicinity. In

addition to these and the 575 young of the year, about 175 immature-plumaged non-breeders frequented the edges of the colony site. This 1944 Cape Romain colony, which contained an estimated total of 1,870 Brown Pelicans of all ages, was two to three times the size of the colony present in each of the five preceding summers.—WILLIAM P. BALDWIN, *Cape Romain National Wildlife Refuge, Mc Clellanville, South Carolina.*

White Pelicans in northeastern Ohio.—An outstanding record for Canton bird students was recorded May 19–20, 1945, when eight White Pelicans (*Pelecanus erythrorhynchos*) visited Lake Cable, a few miles from the Canton city limits. The birds arrived in the late afternoon on May 19. By evening, word of their presence spread via telephone from residents, whose homes surround the lake, to Canton bird students. Several of us planned to visit the lake early the next morning.

At 6:30 on the morning of May 20, a heavy fog completely concealed the lake when I arrived with Mr. and Mrs. John M. Danner. As the fog began to lift about 7:15, the huge forms of the pelicans flickered into view through the ever-changing cloud. We could scarcely believe that so rare a 'find' as this had actually stayed overnight. The air soon cleared and we watched the birds as they swam rapidly about on the other side of the lake. Through our binoculars we had excellent views. Mrs. Vernon Mitchell joined us and was there when the birds took wing about 8:15. They circled high and, when only a mere speck through the binoculars, flew off as if heading for some distant lake. As we were returning to our cars, men who had joined us called that the birds were returning. It was then that we had our second thrill. Seeing the birds was an event in itself, but now they were giving us a performance of their formation flying with special antics added. The birds circled much lower and not far out over the lake. I snapped a few 35 mm. Kodachromes which show the birds in flight, although quite small on the pictures. The pelicans soon alighted on the lake and resumed their swimming. Judge and Mrs. J. L. Floyd arrived a short while later and observed the birds from a better vantage point. Local residents said the pelicans left permanently about 9:15 A. M.

We realized this was the first recorded observation of White Pelicans for Canton. Dr. Oberholser, Curator of Ornithology at the Cleveland Museum of Natural History, has kindly supplied us with some additional data on the occurrence of this species in northeastern Ohio. He states: "While I am not sure that I can give you all the records that have been made in northern Ohio, this much is apparent: There is one record for Lucas County; two for the vicinity of Oberlin; two or three for Sandusky Bay; and one for Wayne County. There are also a few records for northwestern Pennsylvania, not far from the Ohio line, and a few from near Pymatuning Swamp, presumably on the Pennsylvania side. • • • • We have, up to date, no certain record for the vicinity of Cleveland. The bird appears to be of more frequent appearance in central Ohio, that is, in the general region of Columbus than in any other part of the state, as there are a number of records for this species in this area."

We wondered if these birds might have been wanderers, possibly unmated birds. The horny prominence on the bill was plainly visible in flight on at least several of them.—ROBERT E. BALL, *2622 Tuscarawas Street West, Canton 6, Ohio.*

Great White Heron in Mississippi.—On July 4, 1945, while on the deck of a 34-foot cabin cruiser at the mouth of the Jordan River in Bay St. Louis, Mississippi, the writer identified a Great White Heron (*Ardea occidentalis occidentalis*).

The bird, apparently an adult, was on the top of a boathouse and flew when we were within fifty yards, landing by the side of a marshy island a short distance away. Excellent views were had through 8-power binoculars while the bird was on the boathouse, in flight, and again when it was on the island. As it was about noon and the light good, there could be no confusion with the American Egret which is fairly common in that area. The legs were distinctly light yellowish, a diagnostic mark of this species, the bill large and yellowish, and the plumage immaculately white. These features as well as the size, behavior and rather heavy flight made the identification certain. Mr. Charles Breath, owner of the boat, also pronounced the legs pale yellowish after studying the bird through his own field glasses. The water at this point is salt and tidal and the location about three miles from Mississippi Sound, a part of the Gulf of Mexico. Another trip on July 8 to the same place on Bay St. Louis failed of results. A few white birds were seen at a distance but too far away for identification.

The writer spent almost four years at Key West as Refuge Manager for the Fish and Wildlife Service and became very familiar with these herons, making daily studies and photographs along the Florida keys and in the federal refuges.

There seem to be no records to date for either Mississippi or Louisiana as the recent admirable work, 'The Bird Life of the Gulf Coast Region of Mississippi' by Mr. Thomas D. Burleigh, 'The Bird Life of Louisiana' by Dr. Harry C. Oberholser, and other authorities have been consulted. In addition, Mr. Frederick C. Lincoln states that there are no records on file with the Fish and Wildlife Service for this bird in either of these states or in Alabama or Texas.

Some questions naturally arise. Where did it come from? Is it possible that some Great Whites make a northward migration in summer similar to certain other members of the heron family? In view of its restricted habitat and habits this does not seem likely, and there are not enough records of wandering birds as yet to warrant such a statement. Did stormy weather bring it here? There was a hurricane, June 22–24, which swept along the western coast of Florida, then turned eastward to the Atlantic near Daytona. However, from the position and direction of this storm, it is hardly possible that it was responsible. Have Navy and Army activities, such as bombing, firing, and aërial maneuvers along the Florida keys, frightened some birds from that area? Probably this individual was just a casual or accidental visitor; many such cases occur in the bird world. However, it is suggested that ornithologists and bird students, who are familiar with the species, keep a sharp lookout for this magnificent bird, which occasionally strays from its real home among the Florida keys.—EARLE R. GREENE, *22 Virginia Court, New Orleans 19, Louisiana.*

RECENT LITERATURE

Birds of northern Siam.[1]—Siam, the core of the Indo-Chinese countries, was until quite recently strangely neglected by ornithologists. About 1912 a period of active exploration and collecting began due to the efforts of N. Gyldenstolpe, E. Eisenhofer, H. M. Smith, R. M. de Schauensee, J. A. Griswold, Jr., Herbert G. Deignan, and others. In the present report, Deignan summarizes the results of these collections on the basis of a personal examination of most of the material including the types in European museums. His report is by far the most thorough and reliable study that has ever been made on the birds of any of the southeastern Asiatic countries. The most recent findings are incorporated throughout not only on geographical variation but also on generic classification. The author lists in the introduction the itineraries of the principal collectors and discusses the zoogeographic subdivisions. I would have liked a more detailed treatment of the very interesting faunal differences between the various rather isolated mountain ranges. Perhaps Deignan felt that the time for such an analysis has not yet come, considering the incompleteness of our knowledge of their faunas. No statistics are given of the number of breeding species, migrant visitors, and endemic forms.

In the descriptions of the individual species much detailed information is given on the ranges, the habitats, behavior and voice, breeding season, plumages and color of the soft parts of North Siamese birds.

I am not sure that I agree with Deignan's treatment of the *Sitta europaea-castanea* and the *Criniger tephrogenys-ochraceus* relationships. The facts are that in either case the members of the pair are geographical representatives but nowhere intergrade in spite of the absence of geographical barriers. Wherever they approach each other geographically they show strikingly different ecological preferences. Deignan solves this puzzle by uniting the *Sitta* forms under the name *europaea*, and the *Criniger* forms under the name *ochraceus*. Personally, I would be inclined to consider the striking ecological divergence of these sympatric forms as an indication that they have reached the level of specific difference. Such a solution would be entirely in line with Lack's discussion of the ecological status of closely related species (*Ibis*, 1944). Admittedly, however, one cannot be dogmatic in the treatment of such obvious borderline cases. In view of their interest, it would have been valuable if the author had given distribution maps of these species.—E. MAYR.

An introduction to Argentine ornithology.[2]—This publication presents an introduction to the study of birds for the use of students in Argentina and has, therefore, particular application to Argentine forms. It begins with a general account of avian characteristics as a foundation. This section embraces also a discussion of the classification of birds with a list of the Argentine fossil species and a second list of the whole Argentine avifauna down to families. There are also important lists of migratory species divided into three groups—those that visit Argentina from the Northern Hemisphere, those that leave the country to winter in more northern parts of South America, and those that winter in northern Argentina but withdraw to more southern areas to nest. These lists are interestingly annotated.

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[1] DEIGNAN, H. G. 'The Birds of Northern Thailand.' 572 pp., 9 pl., 4 maps, bibliog., 1945. Smithsonian Institution, Washington, D. C. Price, $1.25.

[2] PEREYRA, José A. 'Nuestras Aves.' Large 8vo, pp. 1–338 + 1, figs. 1–102 + 4 figs. Rep. Argentina, Minist. Obras Publicas, Prov. B. Aires, Comision Central Honor. Parques Provinc. y Protect. Fauna Flora Aborig., La Plata, 1943.

The second portion of the work contains general descriptive accounts of each family. The third section discusses geographical distribution and divides Argentina into six zones as shown on an accompanying map. The subspecies of birds found in each zone are then recorded with scientific and vernacular names. An account of the utility of birds, a historical summary of Argentine ornithology, and notes on bird study and taxidermy close this section.

Following this major portion of the work there is a history of bird protection in the country with a recapitulation of the laws in force on this subject, and the names of individuals in various organizations particularly interested in it. Proposals for amendment of the laws are given by Luciano H. Valette and Carlos A. Marelli.

Indexes to the vernacular names, to anatomical terms, to families, subfamilies and genera, and to species and subspecies mentioned in the text furnish a useful means of reference.

The illustrations are from photographs and drawings. Some of the latter are very good, but others, it must be observed, are rather sketchy.

The publication should find a very welcome place in the hands of Argentine students who have here a work in their own language that will help them to pursue the study of the birds of their country.—J. T. Zimmer.

Birds of the world.[1]—In this latest volume of his important check-list, Peters takes up the families of hummingbirds, colies, trogons, kingfishers, todies, motmots, bee-eaters, cuckoo-rollers, rollers and ground-rollers, hoopoes, wood hoopoes, and hornbills.

More than half of the book, as might be expected, is concerned with the hummingbirds. With these, Peters has returned to a better and more conservative treatment than was accorded them by Simon in his 'Histoire Naturelle des Trochilidae' (1921). The general sequence of genera follows that of Simon but the inordinate number of genera recognized or created by that author is reduced from 189 to 123, and the number of species from 488 to 327, but the number of subspecies is increased, as seems justifiable, from 657 to 688. Thirteen supposed forms are considered as hybrids and three as artefacts. Simon's confusing and often misleading 'groups' and 'sections' are omitted while his often erroneous nomenclature caused by his curious nomenclatural standards is corrected in line with the International Code.

Probably still further revisions of genera and species should be made, as Peters admits, but such revisions must await a thorough monographic study, not suitable in a check-list. A tendency to base generic distinctions on the ornamental plumes of the males undoubtedly has led to some false conclusions in the past and Peters suggests the need for a study of the females to rectify some of these earlier errors.

There is similar conservatism in the other families treated in the volume. The kingfishers have their genera reduced in number in nearly the same proportion as the hummingbirds, and the hornbills somewhat more. The trogons have lost one genus from Sharpe's 'Hand-List' (*Pyrotrogon*) but various other genera recognized by some authors in the interim are again relegated to synonymy. The bee-eaters, alone, are provided with more genera than those given them by Sharpe—seven in place of Sharpe's five or in place of Parrot's (1911) six. As in Sharpe's volume 17 of the 'Catalogue of Birds in the British Museum' (1892), the cuckoo-rollers (*Leptosomus*) are placed in the same suborder as the rollers and ground-

[1] Peters, James Lee. 'Check-list of Birds of the World.' Volume V. 8vo, pp. XI + 306, August 20, 1945. Harvard University Press, Cambridge, Massachusetts. Price, $5.00.

rollers but in a separate family from the ground-rollers which are considered as of subfamily rank in the same family with the rollers—an arrangement altered by Sharpe in the 'Hand-List.'

The linear arrangement of genera will not satisfy all taxonomists, but the difficulties inherent in any linear disposition must always give rise to differences of opinion. For example, the reviewer is not sure that the Quetzal is the most primitive trogon or that the Giant Hummer should not be placed farther down the scale than it stands at present, but these and other similar questions are not easily settled. In any case, there is no question that this latest volume of the series contains much thought-provoking material and is a valuable contribution for the taxonomist.

Five new names are provided for discovered synonyms—*Polytmus guainumbi doctus, Trogon elegans lubricus, Alcedo cristatus robertsi, Halcyon australasia odites,* and *Bycanistes brevis omissus.*—J. T. Zimmer.

Venezuelan bird collections in review.[1]—This important publication gives the fundamental bases of the present-day knowledge of Venezuelan ornithology. The various collections known to have been made in Venezuela, and their respective collectors, are briefly reviewed with lists of the localities visited, the new species described from each collection (with both the original nomenclature and the modern equivalent), and the authors who have published on the material (with references to an extended bibliography that follows). Portraits are given of many of the collectors mentioned. The maps and accompanying explanatory lists give the names and positions of all the localities where birds have been collected, including, however, in the case of the author's own collections, only those mentioned in his published accounts.

The whole report is excellently planned and executed and makes a very useful reference work giving rise to the wish that other countries were equally thoroughly documented.—J. T. Zimmer.

Swann's Birds of Prey.[2]—The present long-awaited number contains the final pages and plates of volume 2 of this monograph, with introductory matter and index, thus completing the work begun by the author in 1924. The last preceding part (XIV) was issued in 1936. As with all parts issued since Mr. Swann's death in 1926, the present one has been under Dr. Wetmore's able editorship in which he has preserved Swann's views on the systematic position of the treated species in contradistinction to his own sometimes divergent opinions, adding only such imperative matter as has developed in recent years.

The tardiness in the appearance of this concluding part has been due to delay caused by the war, the destruction of all the type during the air attacks on London in 1940, and the subsequent loss at sea of some of the newly set proofs.

The text concludes the discussion of the kestrels (*Cerchneis* pt., with the addition of *Dissodectes*) and closes with the ospreys (*Pandion*). American readers will find the American Sparrow Hawks in this portion and, of course, the American Osprey.

Dr. Wetmore has done an excellent service in bringing to a successful conclusion this comprehensive monograph so unfortunately interrupted by the death of its enthusiastic author.—J. T. Zimmer.

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[1] Phelps, William H. Resumen de las colecciones ornitologicas hechas en Venezuela. Bol. Soc. Venez. Cienc. Nat., no. 61: 325–444 + 1, 56 figs. (31 portrs., 5 maps), July, 1945.

[2] Swann, H. Kirke [and Wetmore, Alexander]. 'A Monograph of the Birds of Prey.' Parts XV to XVI. 4to, pp. i–xx, 449–538, pls. [17, (col.), 20, 24, 26], April 30, 1945. Wheldon and Wesley, Ltd., London.

PERIODICAL LITERATURE

ABBOTT, ROY L. The year of the Loon. Frontiers, 9 (5): 142–143, 157, June, 1945.

AGRELL, IVAR. The collemboles in nests of warm-blooded animals with a method for sociological analysis. Kungl. Fysiogr. Sällsk. Handl. (N. F.) 56 (10): 1–19, Aug. 10, 1945.

ALDRICH, ELMER C. Nesting of the Allen Hummingbird. Condor, 47 (4): 137–148, figs. 22–26, July–Aug., 1945.

ALLEN, R. C. R. Ring-Ouzels in Berkshire. Brit. Birds, 38 (13): 256, June 1, 1945.

ANONYMOUS. Rare bird reported from Cuba. Bull. Mass. Aud. Soc., 29 (7) sect. 1: 219, Oct., 1945.—Cuban Ivory-billed Woodpeckers.

ANONYMOUS. The Jewel Room [Bronx Zoo]. Animal Kingdom, 48 (4): 106–108, 5 figs., July–Aug., 1945.

ARNOLD, T. W. Waxwings in Buckinghamshire. Brit. Birds, 38 (13): 254, June 1, 1945.

ASMUNDSON, V. S. Crooked neck dwarf in the domestic fowl. Jour. Hered., 36 (6): 173–176, figs. 5–7, June, 1945.

ASMUNDSON, V. S. A triple-allele series and plumage color in turkeys. Genetics, 30 (4): 305–322, fig. 1, July, 1945.

AXTELL, HAROLD H. The Cliff Swallow in Cortland County. Univ. State N. Y. Bull. to Schools, 31 (7): 232–236, 1 map, Mar., 1945.

BAGNALL-OAKELEY, R. P. Birds of the Norfolk coast. Field, 186 (4830): 62–63, 6 figs., July 21, 1945.

BAILEY, ALFRED M. Birds of the Louisiana gulf coast. Aud. Mag., 47 (3) sect. 1: 166–172, 10 figs., 1 map, May–June, 1945.

BAILEY, ALFRED M. On the trail of the Roadrunner. Aud. Mag., 47 (4) sect. 1: 224–229, 6 figs., July–Aug., 1945.

BAILEY, GUY A. Notes on the Chimney Swift. Univ. State N. Y. Bull. to Schools, 31 (7): 200–202, 3 figs., Mar., 1945.

BAILEY, HAROLD H. North American classification and nomenclature, past and present. Bailey Mus. Libr. Nat. Hist., Bull. 15: 1–4, 1945.

BAILEY, JOHN H. The Davenport May dawn bird concert. Iowa Bird Life, 15 (3): 38–40, 2 figs., Sept., 1945.

BAKER, EMILIE AND BERNARD. A repeat nesting of Robins. Jack-Pine Warbler, 23 (3): 122–123, pl. 13, July, 1945.

BARGER, N. R. Some conclusions about the raven. Pass. Pigeon, 7 (3): 69, July, 1945.

BARLEE, JOHN, AND RUTTLEDGE, ROBERT T. Fulmar colonies on Clare Island, Co. Mayo. Brit. Birds, 38 (17): 336, Oct. 1, 1945.

BARNES, J. A. G. Black-headed Gull feeding independent young. Brit. Birds, 38 (15): 299–300, Aug. 1, 1945.

BAUMBRAS, PHILIP. Crow killed by a Red-tailed Hawk. Wils. Bull., 57 (2): 129, June, 1945.

BAYNARD, OSCAR E. Check list of the birds of Hillsborough River State Park. Florida Nat., 18 (4): 64–67, July, 1945.

BEALS, MARIE V. Birdbanding. Univ. State N. Y. Bull. to Schools, 31 (7): 231–232, 1 fig., Mar., 1945.

BEAMISH, HULDINE V. Domesticating wild birds. Field, 185 (4823): 552, 2 figs., June 2, 1945.

BEARD, ELIZABETH BROWNE. Adventures with birds at the St. Clair Flats. Jack-Pine Warbler, 23 (2): 55–66, pl. 5, figs. 2–7, Apr., 1945.

BEDFORD. Heron alighting on water. Brit. Birds, **38** (17): 335, Oct. 1, 1945.

BEDFORD. The song-period of the Blackbird. Brit. Birds, **38** (13): 256, June 1, 1945.

BEHLE, WILLIAM H., AND ROSS, AARON. Miscellaneous records of birds uncommon in Utah. Condor, **47** (4): 168–170, July–Aug., 1945.

BENNITT, RUDOLF. Some social factors influencing quail hunting in Missouri, 1938–1944. Jour. Wildl. Manage., **9** (3): 195–202, July, 1945.

BENSON, F. M. Observations on a nesting colony of Mottle-backed Weavers, (*Sitagra nigriceps nigriceps* Layard), including attacks by a Harrier Hawk (*Gymnogenys typicus typicus* (Smith). Ostrich, **16** (1): 54–65, Mar., 1945.

BERESFORD, G. DE LA P. The winter food of birds in Kashmir. Jour. Bombay Nat. Hist. Soc., **45** (1): 86–88, Dec., 1944.

BERGMAN, STEN. Blåmesens uppfödning av sina ungar. Vår Fågelvärld, **4** (3): 136–139, 1945.

BERRY, J. FRANK. Mite-y troubles among the Martins. Nature Mag., **38** (6): 303–304, 5 figs., June–July, 1945.

BERST, ANTONIO. Estudios y observaciones sobre las aves de Santa Fe [Argentina]. La Inmaculada: 3–16, Apr., May, June, **1941**.

BEVEN, G. An area census in Zululand. Ostrich, **16** (1): 1–18, figs. 1–5 + 2 figs., Mar., 1945.

BEVEN, G. Hobby eating birds in the air. Brit. Birds, **38** (17): 334, Oct. 1, 1945.

BEVEN, G. 'Relative counts' in indigenous forest. Ostrich, **16** (1): 65–69, Mar., 1945.

BISHOP, JAMES S. Pheasant mortality and nesting success. Conn. State Bd. Fisheries and Game, Pittman-Robertson Bull. No. **1**: 3–46, figs. 1–8, 1 pl., 11 figs., July, 1945.

BLACKMAN, THOMAS M. War casualties among the birds. Nat. Hist., **54** (7): 298–299, 2 figs., Sept., 1945.

BLAIR, CHARLES H. A Kentucky Warbler banded at Jackson, Michigan. Jack-Pine Warbler, **23** (3): 105–106, 1 fig., July, 1945.

BLAIR, H. M. S. Manx Shearwater breeding on Durham coast. Brit. Birds, **38** (14): 276–277, July 2, 1945.

BLAKE, LOUISE C. The care of a fledgling. Univ. State N. Y. Bull. to Schools, **31** (7): 204–205, 3 figs., Mar., 1945.

BOEHM, E. F. Nidification of the Yellow-fronted Honeyeater in South Australia. So. Austral. Ornith., **17** (5): 51–52, Mar., 1945.

BOND, JAMES. Notes on Peruvian Furnariidae. Proc. Acad. Nat. Sci. Phila., **97**: 17–39, June, 13, 1945.

BOLT, A. W. Status of Corn-Crake in Gloucestershire. Brit. Birds, **38** (14): 278–279, July 2, 1945.

BRECHER, LEONARD C. Data on the nesting habits of the Yellow-billed Cuckoo. Kentucky Warbler, **21** (3): 33–42, Summer, 1945.

BRERETON, E. L. An Ontario sight record of the Western Grebe, *Aechmophorus occidentalis*. Canad. Field-Nat., **59** (2): 68, Mar.–Apr., 1945.

BRERETON, E. L. The Screech Owl, an efficient mouse catcher. Canad. Field-Nat., **59** (2): 68, Mar.–Apr., 1945.

BRIMLEY, H. H. Some notes on Gilbert White's "Natural History of Selborne." Part IV. Chat. **9** (4): 56–58, Sept., 1945.

BROOKS, MAURICE. George Sutton and his warbler. Aud. Mag., **47** (3) sect. 1: 145–150, 2 figs., May–June, 1945.

BROOKS, MAURICE G. A check-list of West Virginia birds. **Bull. Agr. Exper. Sta., W. Virginia Univ., 316**: 1–56 + 4 pp. (unnum.), 1 pl., 2 cover illustrs., Dec., 1944. —An annotated list with statements of the local status of each form and occasionally more definite statements of the basic records.

BRYAN, PAUL. Use of Wood Duck nesting boxes in Wheeler Wildlife Refuge, Alabama. Jour. Tennessee Acad. Sci., **20** (1): 35–40, Jan., 1945.

BRYK, FELIX. En obekant ornitologisk strift av Carl von Linné. **Vår Fågelvärld, 4** (3): 97–101, 1945.

BUEKER, ELMER D. The influence of a growing limb on the differentiation of somatic motor neurons in transplanted avian spinal cord segments. **Jour. Comp. Neurol., 82** (3): 335–361, pls. 1–2, fig. 12, June, 1945.

BUELL, BERTHA G. A Blue Jay apparently "anting." **Jack-Pine Warbler, 23** (2): 74, Apr., 1945.

BULL, ARTHUR J. Ferruginous Duck in Dorset. Brit. Birds, **38** (15): 298, Aug. 1, 1945.

BURMESTER, B. R. The incidence of lymphomatosis among male and female chickens. Poultry Sci., **24** (5): 469–472, fig. 1, Sept., 1945.

BURNETT, FRANCES L. Double-crested Cormorants nest off Manchester, Massachusetts. Bull. Mass. Aud. Soc., **29** (7) sect. 1: 205–207, 4 figs., Oct., 1945.

BURTON, R. E. Ringed Plover breeding in Northamptonshire. **Brit. Birds, 38** (14): 278, July 2, 1945.

BUTLER, R. W. Head movements of drumming woodpecker. **Field, 184** (4824): 580, 1 fig., June 9, 1945.

BUTLIN, S. M., AND TUCKER, B. W. Display of Spotted Flycatcher. **Brit. Birds, 38** (17): 333–334, Oct. 1, 1945.

BUXTON, E. J. M. Fertility and mortality in the nest of continental Great Tits. Brit. Birds, 38 (15): 288–289, Aug. 1, 1945.

BUXTON, E. J. M. On the nuptial display of the Redstart. **Brit. Birds, 38** (15): 282–287, Aug. 1, 1945.

CALDER, DAVID R. A visit to Port St. Johns. Ostrich, **16** (1): 18–31, Mar., 1945.

CALHOUN, JOHN B. Twenty-four periodicities in the animal kingdom. **Part II.** The vertebrates (cont.). Jour. Tenn. Acad. Sci., **20** (3): 291–308, **July, 1945.**

CARL, G. CLIFFORD, AND HARDY, GEORGE A. Flora and fauna of the Paradise Mine area, British Columbia. Rept. Prov. Mus. Nat. Hist. and Anthropol. for **1944:** Cli–C38, 1 pl., 1945.—Birds on pp. C31–C32.

CHAMPY, C.; COUJARD, R.; AND CHAMPY-COUJARD, C. Effets secondaires d'injections de dihydrofolliculine chez des gallinacés males. Comptes Rendus Soc. Biol. (Paris), **135** (11–12): 841–844, June, 1941.

CLANCEY, P. A. The racial status of northern Scottish Great Tits. **Bull. Brit. Orn. Club, 457**: 44, June 20, 1945.

CLARKE, C. H. D. Some bird records for Yukon Territory. **Canad. Field-Nat., 59** (2): 65, Mar.–Apr., 1945.

CLARKSON, ELIZABETH BARNHILL. Wing haven. Aud. Mag., **47** (4) sect. 1: 230–233, 3 figs., July–Aug., 1945.

COFFEY, MRS. BEN B., JR. Further notes on Memphis nesting census. **Migrant, 16** (2): 33, June, 1945.

COFFEY, MRS. BEN B. Swifts take refuge from rain. **Migrant, 16** (2): 31, June, 1945.

COGSWELL, HOWARD L. Rainbow Island. Aud. Mag., **47** (5) sect. 1: 273–278, 4 figs., Sept.–Oct., 1945.

CONOVER, BOARDMAN. A new race of *Penelope argyrotis* from Colombia. Proc. Biol. Soc. Washington, **58**: 125–126, Sept. 20, 1945.—*P. a. mesaeus* (Pamplona, Santander del Norte, Colombia).

COOK, STEPHEN E. Yellow-browed Warblers in Northumberland. Brit. Birds, **38** (13): 255, June 1, 1945.

COTTAM, CLARENCE. Feeding habits of the Clark Nutcracker. Condor, **47** (4): 168, July–Aug., 1945.

COTTAM, CLARENCE. Some records of birds in Utah. Condor, **47** (4): 172–173, July–Aug., 1945.

COWAN, I. MCTAGGART, AND MUNRO, J. A. Birds and mammals of Revelstoke National Park. Canad. Alpine Jour., **29** (1): 100–121, 1 pl. (fold.), May, 1945.

CRANDALL, LEE S. A brilliant flash—That's the manakin's display. Animal Kingdom, **48** (3): 67–69, 3 figs., May–June, 1945.

CRANDALL, LEE S. The Umbrella Bird is not a dull fellow any more. Animal Kingdom, **48** (4): 109–112, 6 figs., July–Aug., 1945.

CRANDALL, LEE S. We have two of the rarest chicks in the world. Animal Kingdom, **48** (4): 119, July–Aug., 1945.—Wattled Cranes.

CROCKETT, HARRY L. AND RUTH. Arizona birds. Arizona Highways, **21** (2): 18–27, 8 pls. (col.), Feb., 1945.

CUMLEY, R. W., AND IRWIN, M. R. The correlation between antigenic composition and geographic range in the Old or New World in some species of Columba. Amer. Naturalist, **78** (776): 238–256, fig. 1, May–June, 1944.

CURRIER, ESTHER MEAD. Try the Red-winged Blackbird. Univ. State N. Y. Bull. to Schools, **31** (7): 220–221, 3 figs., Mar., 1945.

CURRY-LINDAHL, KAI. Några iakttagelser vid ett bo av lärkfalk, *Falco s. subbuteo* L. Fauna och Flora, **5**: 193–206, figs. 1–2, 1945.

DAVIS, DAVID E. The occurrence of the incubation-patch in some Brazilian birds. Wils. Bull., **57** (3): 188–190, Sept., 1945.

DAVIS, J. G. Observations on Montagu's Harrier. Brit. Birds, **38** (17): 334–335, Oct. 1, 1945.

DELACOUR, J. Decorative aviaries in the New York Zoo. Avic. Mag., (5) **10** (3): 57–58, 1 pl., May–June, 1945.

DELACOUR, JEAN. The display of the Maned Goose. Wils. Bull., **57** (2): 129, June, 1945.

DELMÉE, E. Dix années d'observations sur les mouers de la Mésange Charbonnière et de la Mésange Bleue, *Parus major major* L. et *Parus caeruleus caeruleus* L. parles nichoirs et le baguage. Gerfaut, **30** (3): 97–129 (cont.), 1 pl., 1940.

DE LONG, MRS. W. C. Warblers seen from my window. Iowa Bird Life, **15** (3): 40–42, 4 figs., Sept., 1945.

DE MAERSCHALCK. Quelques observations faites au cours de la saison de nidification 1939. Gerfaut, **30** (2): 78–81, 1940.

DERLETH, AUGUST. Sac prairie summer. Pass. Pigeon, **7** (3): 72–75, July, 1945.

DE SCHAUENSEE, RODOLPHE MEYER. Notes on *Buteo magnirostris*, with a description of a new form from Peru. Not. Nat., **156**: 1–4, Aug. 1, 1945.—*B. m. inca*, new subspecies from La Oroya, Inambari, Dept. Puno, southeastern Peru.

DE SCHAUENSEE, RODOLPHE MEYER. Notes on Colombian antbirds, ovenbirds, and woodhewers, with the description of a new form from Peru. Not. Nat., **153**: 1–15, May 23, 1945.—*Thamnophilus aethiops wetmorei* (La Morelia, Col.), *Herpsilochmus sticturus dugandi* (Belén, Col.), *Terenura callinota peruviana* (Río Jelashte, Perú), *Cinclodes fuscus paramo* (Mayasquer, Col.), *Thripadectes virgaticeps magda-*

lenae (La Candela, Col.), and *Lepidocolaptes lacrymiger sneiderni* (El Tambo, Col.), new subspecies.

DEXTER, RALPH W. Bird study as an educational project. Sci. Educ., 29 (2): 89–91, Mar., 1945.

DHARMAKUMARSINHJI, PRINCE K. S. The Bustard-Quail at home (*Turnix suscitator taigoor*). Avic. Mag., (5) 10 (3): 58–60, May–June, 1945.

DUGAND, ARMANDO. Notas ornitológicas Colombianas, I. Caldasia, 3 (13): 335–341, Apr. 30, 1945.

DU MONT, PHILIP A. The invasion of the Starling into Iowa. Iowa Bird Life, 15 (2): 30–33, 1 map, June, 1945.

DUNT, R. H.; MAY, D. J.; AND ALABASTER, B. H. Courtship feeding of Linnet. Brit. Birds, 38 (17): 333, Oct. 1, 1945.

DUPOND, CH. Hybride de Tarin des aulnes × Canari domestique, monstre à trois pattes. Gerfaut, 30 (1): 32, 1940.

DUPOND, CH. Une incursion de *Pterocles o. orientalis* (L.) en Belgique. Gerfaut, 32 (1): 1–15, 1 pl., 1942.

DUPOND, CH. Le nid de l'Hirondelle de fenêtre. *Delichon u. urbica* (L.). Gerfaut, 30 (1): 31, 1940.

DUPOND, CH. Nidification de la Pie. Gerfaut, 30 (1): 33–34, 1940.

DUPOND, CH. Note pour contribuer à l'étude des formes du Pipit des Arbres *Anthus trivialis* L. Gerfaut, 30 (1): 28–29, 1940.

DUPOND, CH. Oeuvre du baguage des oiseaux en Belgique. Gerfaut, 32 (2): 33–39, 1942.

DUPOND, CH. Oiseaux bagués à l'étranger et retrouvés en Belgique. Gerfaut, 30 (2): 81–87, 1940.

DUPOND, CH. Oiseaux bagués à l'étranger et retrouvés en Belgique. Gerfaut, 30 (3): 135–139, 1940.

DUPOND, CH. Quelques exemples de commensalisme chez les oiseaux. Gerfaut, 32 (2): 48–53, 1942.

DUPOUY, WALTER. Una interesante "Ardea herodias" de la Isla San Roque, Venezuela. Mem. Soc. Cienc. Nat. La Salle (Caracas), 4 (12): 38–43, 2 figs., 1945.

EGGERMONT, D. Une femelle Verdier polyandre. Gerfaut, 30 (2): 88, 1940.

EIFERT, VIRGINIA S. These birds are America. Aud. Mag., 47 (5) sect. 1: 258–263, 6 figs., Sept.–Oct., 1945.

ELLIOTT, JOHN J. Companions of the sea. Univ. State N. Y. Bull. to Schools, 31 (7): 211–213, 3 figs., Mar., 1945.

ELWONGER, RUTH. Amazing adjustments made by this Sanderling. Gull, 27 (8): 28–29, Aug., 1945.

ENGLAND, M. D. Singing of breeding female Chaffinch. Brit. Birds, 38 (14): 274, July 2, 1945.

ERRINGTON, PAUL L. Some contributions of a fifteen year local study of the northern Bobwhite to a knowledge of population phenomena. Ecol. Monogr., 15: 1–34, figs. 1–23, Jan., 1945.

EVERETT, N. B. The present status of the germ-cell problem in vertebrates. Biol. Reviews, 20 (2): 45–55, Apr., 1945.

FALKNER, GUY. The Japanese Blue Flycatcher *Cyanoptila cyanomelaena*. Avic. Mag., (5) 10 (2): 53–54, Mar.–Apr., 1945.

FALLIS, A. MURRAY. Population trends and blood parasites of Ruffed Grouse in Ontario. Jour. Wildl. Manage., 9 (3): 203–206, figs. 1–2, pl. 9, July, 1945.

FENNELL, R. A. The relation between heredity, sexual activity and training to dominance-subordination in game cocks. Amer. Naturalist, **79** (781): 142–151, fig. 1, Mar.–Apr., 1945.

FITTER, R. S. R.; PARRINDER, E. R.; ET AL. The 1945 immigration of Black-winged Stilts. Brit. Birds, **38** (17): 336–338, Oct. 1, 1945.

FITTER, R. S. R. Report of the Black Redstart inquiry for 1944. Brit. Birds, **38** (13): 247–249, pl. 6, June 1, 1945.

FRIEDMANN, HERBERT. A new ant-thrush from Venezuela. Proc. Biol. Soc. Wash., **58**: 83–84, June 30, 1945.—*Myrmeciza disjuncta*, new species from Cerro Yapacana, Upper Orinoco, Venezuela.

FRIEDMANN, HERBERT. A new manakin from Cerro Yapanaca, Upper Orinoco Valley, southern Venezuela. Proc. Biol. Soc. Wash., **57**: 99–100, Nov. 30, 1944.—*Manacus manacus umbrosus*, new subspecies.

FRIEDMANN, HERBERT. A review of the forms of *Colinus leucopogon* (Lesson). Proc. Biol. Soc. Wash., **57**: 15–16, June 28, 1944.—*Colinus leucopogon incanus*, new subspecies from Saloma, Baja Vera Paz, Guatemala.

FRIEDMANN, HERBERT. The genus *Nyctiprogne*. Proc. Biol. Soc. Wash., **58**: 117–119, July 18, 1945.—*Nyctiprogne latifascia*, new species from Raudal Quirabuena, Brazo Casiquiare, Venezuela; *N. leucopyga exigua*, new subspecies from right bank of Upper Orinoco opposite Corocoro Is., Venezuela.

FRIEDMANN, HERBERT. Two new birds from the Upper Rio Negro, Brazil. Proc. Biol. Soc. Wash., **58**: 113–115, July 18, 1945.—*Capito auratus transilens* and *Brotogeris chrysopterus tenuifrons*, new subspecies from Santa Isabel, Rio Negro, Amazonas, Brazil.

FURNER, A. C. Corncrake in captivity. Avic. Mag., (5) **10** (3): 82–83, May–June, 1945.

GANIER, ALBERT F. Alder Flycatcher at Memphis. Migrant, **16** (2): 29, June, 1945.

GIVENS, SPR. T. V. Bird "anting." Victor. Nat., **62** (1): 8–9, May, 1945.

GLADING, BEN; ENDERLIN, R. W.; AND HJERSMAN, HENRY H. The Kettleman Hills quail project. Calif. Fish and Game, **31** (3): 139–156, figs. 37–47, July, 1945.

GLEGG, WILLIAM E. Bewick's Swans and Red-necked Grebe in Hertfordshire. Brit. Birds, **38** (14): 275, July 2, 1945.

GLEGG, WILLIAM E. Party of Knots inland in Hertforsdhire. Brit. Birds, **38** (14): 277, July 2, 1945.

GLEIZE, DANIEL A. Birds of Tinian [Marianas]. Bull. Mass. Aud. Soc., **29** (7) sect. 1: 220, Oct., 1945.

GOSLIN, ROBERT. Bird remains from an Indian village site in Ohio. Wils. Bull., **57** (2): 131, June, 1945.

GRAHN, YNGVE. Två anmärkningsvärda bofynd av tofsmes (*Parus cristatus* L.) i Skåne. Vår Fågelvärld, **4** (3): 140, 1945.

GRANT, C. H. B., AND MACKWORTH-PRAED, C. W. Notes on Eastern African birds. Bull. Brit. Orn. Club, **457**: 42–44, June 20, 1945.

GRIFFITHS, W., AND WILSON, W. The birds of North Wirral. No. Western Nat., **19** (4): 238–251, Dec., 1944.

GRAY, W. J. Some notes on the nesting of certain birds in northern Nyasaland. Ostrich, **16** (1): 49–54, Mar., 1945.

GRISCOM, LUDLOW. The changing seasons. Aud. Mag., **47** (3) sect. 1: 185, May–June, 1945.

GRISCOM, LUDLOW. The changing seasons. Aud. Mag., 47 (4) sect. 1: 252–253, July–Aug., 1945.

GRISCOM, LUDLOW. A record New England list. Bull. Mass. Aud. Soc., 29 (6): 171–173, 1 fig., Aug., 1945.

GROESBECK, WILLIAM M. The Tufted Titmouse in New York State. Univ. State N. Y. Bull. to Schools, 31 (7): 222–223, Mar., 1945.

GROTE, HERMANN. Manifestations migratoires chez les oiseaux soi-disant sedentaires. Gerfaut, 30 (1): 14–28, 1 fig., 1940.

GRUBB, DAVID B. Former breeding of Common Sandpiper in Worcestershire. Brit. Birds, 38 (14): 277–278, July 2, 1945.

GULOTTA, WILHELMINA. Bringing the birds to the patients. Aud. Mag., 47 (5) sect. 1: 296–298, Sept.–Oct., 1945.

HAAGNER, A. K. A list of the birds observed in Beira and neighborhood—with some notes on habits, etc. Ostrich, 16 (1): 32–43 (cont.), Mar., 1945.

HALFAWI, SHAMSEDDIN. A collection of birds from western Saudi-Arabia, January–June, 1944. Zool. Soc. Egypt, Suppl. to Bull. 7 (mimeogr.): 1–11, 1 pl., 1945.

HALFLANTS, P. Observations faites au Maroc en 1936 et en Italie en 1938. Gerfaut, 32 (1): 23–27, 1942.

HANNERZ, DAG. Vaktel (*Coturnix coturnix* Lin.) i Värmland och på Öland. Vår Fågelvärld, 4 (3): 140–141, 1945.

HARBER, D. D. Cloaca-pecking of House-Sparrow. Brit. Birds, 38 (15): 296, Aug. 1, 1945.

HARE, H. LEIGHTON. Goshawk and boomslang. Ostrich, 16 (1): 75–76, Mar., 1945.

HARLAN, JAMES R. Blue Geese try Mississippi flyway for first time. Iowa Bird Life, 15 (3): 48, Sept., 1945.

HARLAN, JAMES R. Egret colony at Sabula abandoned. Iowa Bird Life, 15 (3): 48, Sept., 1945.

HARRISON, James M. Iceland Redwing in Lincolnshire. Brit. Birds, 38 (13): 255–256, June 1, 1945.

HARRISON, JAMES M. Iceland Redshank in Norfolk. Brit. Birds, 38 (13): 256–257, June 1, 1945.

HARRISON, JEFFERY G., AND MOORE, NORMAN W. Oyster-catcher breeding in East Sussex. Brit. Birds, 38 (17): 338, Oct. 1, 1945.

HARTLEY, P. H. T. Courtship feeding of Hoopoe. Brit. Birds, 38 (17): 334, Oct. 1, 1945.

HARVEY, BERNARD F. Guillemot using wings on surface of water. Brit. Birds, 38 (17): 339, Oct. 1, 1945.

HAWBECKER, ALBERT C. Food habits of the Barn Owl. Condor, 47 (4): 161–166, figs. 30–31, July–Aug., 1945.

HAYS, F. A. The primary sex ratio in domestic chickens. Amer. Naturalist, 79 (781): 184–186, Mar.–Apr., 1945.

HEDGES, FRANK R. Evening Grosbeaks feeding on Russian olive berries. Condor, 47 (4): 173, July–Aug., 1945.

HERNDON, LEE R. Elizabethton spring field day. Migrant, 16 (2): 34, June, 1945.

HEWITT, OLIVER H. Recent occurrence of the White Pelican in northern Ontario. Canad. Field-Nat., 59 (1): 45, Jan.–Feb., 1945.

HICKS, LAWRENCE E. Some West Virginia breeding-season records. Wils. Bull., 57 (2): 129–131, June, 1945.

HOECKER S., GUSTAVO. Estudios sobre leucosis en las aves y cuadro hematico normal de gallina. Biológica, 1: 27–84, 9 pls. (figs. 1–17), Sept., 1944.

HOLDER, F. W. Dotterels in South Lancashire. Brit. Birds, **38** (13): 257, June 1, 1945.

HOLMES, CHARLES F. A 1936 Saskatchewan record of the Whooping Crane. Canad. Field-Nat., **59** (2): 69, Mar.–Apr., 1945.

HONEYCUTT, BERTHA CELESTIE. My Ruby-throats. Chat, **9** (4): 49–52, Sept., 1945.

HOWARD, HILDEGARDE. Fossil birds. Los Angeles Co. Mus. Sci. Ser., no. **10** (Paleontol., no. 6): 1–40, 1 pl., figs. 1–18, May, 1945.

HUMPHREYS, G. R. Pink-footed Goose in Co. Wicklow. Brit. Birds, **38** (14): 276, July 2, 1945.

IRWIN, M. R., AND CUMLEY, R. W. Suggestive evidence for duplicate genes in a species hybrid in doves. Genetics, **30** (4): 363–375, July, 1945.

ISENBERG, A. H. Breeding of Silver Eared Mesias. Avic. Mag., (5) **10** (3): 66–69, May–June, 1945.

IZRAL, JOHN A., JR. The butcher bird. Pass. Pigeon, **7** (3): 70–72, July, 1945.

JAMES, T. O. Great Spotted Woodpecker breaking open almond nuts. Brit. Birds, **38** (14): 274–275, July 2, 1945.

JARMAN, HOWARD E. A. Bird observations at Larrimah, Northern Territory of Australia. So. Austral. Ornith., **17** (5): 53–54, Mar., 1945.

JARMAN, HOWARD E. A. Brief bird notes on a hurried trip to Darwin. So. Austral. Ornith., **17** (6): 72, June, 1945.

JARMAN, HOWARD E. A. Brief notes on a hurried journey from Tennant Creek, Northern Territory to Mt. Isa, Queensland. So. Austral. Ornith., **17** (5): 45, Mar., 1945.

JEWETT, STANLEY G. The Blue Goose in California. Condor, **47** (4): 167, July–Aug., 1945.

JEWETT, STANLEY G. The Calliope Hummingbird at Portland, Oregon. Condor, **47** (4): 170, July–Aug., 1945.

JOHANSEN, HANS. Quelques notes sur les trouvailles ornithologiques de la Sibérie orientale, publiées dans le "Gerfaut" 1941, II. Gerfaut, **32** (1): 15–17, 1942.

JOHNSON, CLAUDE E. The Turkey Buzzard in Quebec Province. Canad. Field-Nat., **59** (1): 46, Jan.–Feb., 1945.

JOHNSTON, F. J. Herring-Gulls robbing Lapwings. Brit. Birds, **38** (14): 278, July 2, 1945.

JONES, MYRTLE AND MARGARET. The third annual Iowa spring bird census. Iowa Bird Life, **15** (3): 42–48, Sept., 1945.

KENDEIGH, S. CHARLES. Resistance to hunger in birds. Jour. Wildl. Manage., **9** (3): 217–226, figs. 1–2, July, 1945.

KENDEIGH, S. CHARLES. Nesting behavior of wood warblers. Wils. Bull., **57** (3): 144–164, pl. 11 (col.), figs. 1–2, Sept., 1945.

KIMBALL, J. W. Effects of a hail storm on pheasants and other wildlife. Flicker, **17** (3): 46–50, fig. 1., Oct., 1945.

KIMBALL, J. W. Four rails on a road. Flicker, **17** (3): 64–65, Oct., 1945.

KIMBREY, I. N. Firecrest in Berkshire. Brit. Birds, **38** (13): 254, June 1, 1945.

KINZEL, CARL. Photographing the Great Horned Owl. Pass. Pigeon, **7** (2): 29–32, 2 figs. and cover, Apr., 1945.

KNOWLES, J. Kite in Somerset. Brit. Birds, **38** (15): 298, Aug. 1, 1945.

LACK, DAVID. Possible life-pairing of Nuthatch. Brit. Birds, **38** (15): 297, Aug. 1, 1945.

LASKEY, AMELIA R. Bicknell's Thrush added to Tennessee list. Migrant, **16** (2): 29, June, 1945.

LASKEY, AMELIA R. Blue Grosbeak seen at Nashville, **Migrant, 16** (2): 30, June, 1945.

LAX, J. M. S. Birds seen in India and Burma. **Avic. Mag., (5) 10** (3): 70–71, May–June, 1945.

LEACH, E. P. British recoveries of birds ringed abroad (concl.). **Brit. Birds, 38** (13): 242–246, June 1, 1945.

LEATHERMAN, KENNETH. On the pastures of the sea. **Aud. Mag., 47** (5) sect. 1: 264–272, 13 figs., Sept.–Oct., 1945.

LEES, I. J. FERGUSON, AND SOUTHON, H. A. W. Little Gull in Northamptonshire. **Brit. Birds, 38** (15): 299, Aug. 1, 1945.

LENDON, ALAN. Breeding results for 1944. **Avic. Mag., (5) 10** (2): 33–41, Mar.–Apr., 1945.

LERNER, I. MICHAEL. "Nicking" in relation to sexual maturity of S. C. W. Leghorns. **Amer. Naturalist, 79** (781): 152–159, Mar.–Apr., 1945.

LLOYD, BERTRAM. Buzzards in Pembrokeshire, with some notes on their habit of holding "concourses" or "corroborees." **No. Western Nat., 19** (4): 295–296, Dec., 1944.

LONGLEY, WILLIAM H. Winter bird count: 1944. **Flicker, 17** (2): 27–28, May, 1945.

LORD, J., AND AINSWORTH, G. H. Fight between Little Owls and Barn-Owls. **Brit. Birds, 38** (14): 275, July 2, 1945.

LOVELL, HARVEY B. Reaction of American Mergansers to Herring Gull depredations. **Wils. Bull., 57** (3): 202, Sept., 1945.

LOW, JESSOP B. Ecology and management of the Redhead, *Nyroca americana*, in Iowa. **Ecol. Monogrs., 15** (1): 35–69, figs. 1–21, Jan., 1945.

LOWERY, GEORGE H., JR. Trans-gulf spring migration of birds and the coastal hiatus. **Wils. Bull., 57** (2): 92–121, figs. 1–4, maps 1–4, June, 1945.

LOWTHER, E. H. N. Notes on some Indian birds. IX—Eagles, owls and vultures. **Jour. Bombay Nat. Hist. Soc., 45** (1): 5–16, pls. 1–10, Dec., 1944.

MACDONAGH, EMILIANO J. Las aves de un garzal temporario. **Inst. Mus. Universidad Nacional de La Plata, 7** (Zool. 61): 355–369, figs. 1–8, 1 pl., 1942.

MACDONAGH, EMILIANO J. Observaciones sobre la bandurria de invierno. **Inst. Mus. Universidad Nacional de La Plata, 7** (Zool. 62): 371–382, figs. 1–3, pls. 1–2, 1942.

MACDONALD, ELIZABETH. Only a bird in a gilded cage. **Frontiers, 9** (5): 144–145, 4 figs., June, 1945.—Concerning bird cages.

MACFAYDEN, CLIFFORD J. Breeding of *Tyrannus verticalis* in Ontario. **Canad. Field-Nat., 59** (2): 67, Mar.–Apr., 1945.

MACLAREN, P. I. R. Heron fishing in flight. **Brit. Birds, 38** (13): 256, June 1, 1945.

MALMBERG, TORSTEN. Iakttagelser över flyttfågelsträcket vid Hälsingborg. **Fauna och Flora, 5**: 207–216, 1945.

MARSHALL, WILLIAM H. Caspian Tern at Itasca Park. **Flicker, 17** (3): 64, Oct., 1945.

MARSHALL, WILLIAM H., AND ERICKSON, ARNOLD B. Weights of some Minnesota birds. **Flicker, 17** (2): 32–36, May, 1945.

MARSHALL, WILLIAM H.; ERICKSON, ARNOLD B.; AND PARKER, LANSING A. Woodcock lights on river. **Flicker, 17** (3): 64, Oct., 1945.

MARSHALL, WILLIAM H. Winter bird observations in the Boise National Forest, Idaho. **Condor, 47** (4): 170–172, July–Aug., 1945.

MARSHALL, WILLIAM H. Winter birds of the North Fork of the Flathead River, Montana. **Flicker, 17** (3): 55–58, Oct., 1945.

MARTIN, R. K. Birds of Bombay. Jour. Bombay Nat. Hist. Soc., **45** (1): 88–90, Dec., 1944.

MASTERSON, H. B. The Mottled Swift. (*Micropus aequatorialis*). Ostrich, **16** (1): 70–72, Mar., 1945.

MAY, D. J.; TULLY, H.; AND MANNING, A. Bullfinch and other birds hovering when feeding. Brit. Birds, **38** (13): 253, June 1, 1945.

MAYR, ERNST. Bird conservation problems in the Southwest Pacific. Aud. Mag., **47** (5) sect. 1: 279–282, 2 figs., Sept.–Oct., 1945.

MAYR, ERNST. Bird geography in the Southwest Pacific. Aud. Mag., **47** (3) sect. 1: 159–165, 4 figs., 2 maps, May–June, 1945.

MAYR, ERNST. Bird habitats of the Southwest Pacific. Aud. Mag., **27** (4) sect. 1: 207–211, 5 figs., July–Aug., 1945.

MAYR, ERNST. Birds collected during the Whitney South Sea Expedition. Part 51. Notes on the birds of Northern Melanesia. Amer. Mus. Novitates, **1294**: 1–12, July 20, 1945—New subspecies: *Podiceps ruficollis collaris* (Bougainville Island); *Dendrocygna arcuata pygmaea* (Maulo, Wide Bay, New Britain); *Accipiter novaehollandiae lavongai* (Lavongai, New Hanover); *A. n. matthiae* (St. Matthias Island); *A. n. manusi* (Lombrum, Manus, Admiralty Islands); *A. albogularis gilvus* (Kulambangra, Solomon Islands); *Aviceda subcristata robusta* (Mt. Maitombi, Choiseul Island); *A. s. proxima* (Kieta District, Bougainville Island); *A. s. coultasi* (Lombrum, Manus, Admiralty Islands).

MAYR, ERNST. Note on the status of *Ploceus graueri*. Bull. Brit. Orn. Club, **457**: 41–42, June 20, 1945.

MCCASKILL, L. W. Preliminary report on the present position of the Australian Magpies (*Gymnorhina hypoleuca* and *G. tibicen*) in New Zealand. N. Z. Bird Notes, **1** (8): 85–104, 1 map, Apr., 1945.

MCCULLOCH, NORMAN, JR.; COFFEY, JOHN, JR.; AND SIMPSON, MRS. R. C. Great Blue Heron dives. Chat, **9** (4): 62, Sept., 1945.

MCGIBBON, W. H. Further division of contrasting antigens in species hybrids in ducks. Genetics, **30** (3): 252–265, May, 1945.

MCGILP, J. NEIL. *Meliphaga plumula*, Yellow-fronted Honeyeater. So. Austral. Ornith., **17** (5): 46–51, Mar., 1945.

MEADE, GORDON M. "What kills cock Robin?" Univ. State N. Y. Bull. to Schools, **31** (7): 202–203, Mar., 1945.

MEDLICOTT, W. S. Feeding habits of a Great Grey Shrike in Yorkshire. Brit. Birds, **38** (13): 253–254, June 1, 1945.

MEYER, HENRY. Spring migration of the Red-headed Woodpecker. Migrant, **16** (2): 32, June, 1945.

MILES, ELEANOR AND PHILIP. Raven's nest. Pass. Pigeon, **7** (3): 68–69, July, 1945.

MISCELLANEOUS. Audubon field notes. Winter season. Aud. Mag., **47** (3) sect. 2: 17–28, May–June, 1945.

MISCELLANEOUS. Audubon field notes. Spring migration. Aud. Mag., **47** (4) sect. 2: 29–43, July–Aug., 1945.

MISCELLANEOUS. Audubon field notes. Nesting season. Aud. Mag., **47** (5) sect. 2: 45–56, Sept.–Oct., 1945.

MISCELLANEOUS. Christmas bird census—1944. Canad. Field-Nat., **59** (1): 31–38, Jan.–Feb., 1945.

MISCELLANEOUS. Faune de Belgique. Observations ornithologiques faite en Belgique de mai 1939 à mai 1940 rassemblées par CH. DUPOND. Gerfaut, **30** (2): 41–78, 1940.

MISCELLANEOUS. Observations ornithologiques faites en Belgique de mai 1940 à mai 1941. Gerfaut, **31** (2): 37–67, 1941.

MISCELLANEOUS. Observations ornithologiques faites en Belgiques de mai 1941 au printemps 1942. Gerfaut, **32** (3): 65–92, 1942.

MISCELLANEOUS. Purple-headed Starlings in the British Isles. Bull. Brit. Orn. Club, **457**: 33–38, June 20, 1945.

MISCELLANEOUS. The [Kentucky] Warbler's first annual big spring list. Kentucky Warbler, **21** (3): 42–47, Summer, 1945.

MITCHELL, H. D. Migration route of the White-crowned Sparrow. Prothonotary (mimeogr.), **11** (5): 22, May, 1945.

MONRO, RONALD K. Young herons. Nat. Hist., **54** (7): 311–314, 11 figs., Sept., 1945.

MOODY, A. F. An early account of some of the perching birds in the Scampston collection (cont.). Avic. Mag., (5) **10** (2): 48–53, Mar.–Apr., 1945.

MOODY, A. F. An early account of some of the perching birds in the Scampston collection. Avic. Mag., (5) **10** (3): 76–81, May–June, 1945.

MOOJEN, J. Uiracu [Harpia harpja (Linn.)]. Revista Mus. Nacional, **1** (2): 16, 1 pl. (col.), Dec., 1944.

MOORE, JEANNE E. Five barn owlets. Jack-Pine Warbler, **23** (3): 95–104, pls. 11–12, July, 1945.

MOREAU, R. E., AND W. M. Extensive plastering by Nuthatch. Brit. Birds, **38** (15): 297–298, Aug. 1, 1945.

MOREHOUSE, NEIL F. The occurrence of *Haemoproteus* sp. in the domesticated turkey. Trans. Amer. Microscop. Soc., **64** (2): 109–111, figs. 1–2, Apr., 1945.

MORRISON, KENNETH D. Hawks and owls win in Minnesota. Aud. Mag., **47** (4) sect. 1: 234–236, 4 figs., July–Aug., 1945.

MORSE, MARIUS. Natural history notes from the Aleutians. Part II. Flicker, **17** (2): 23–26, May, 1945.

MORSE, MARIUS. Observations on birds and mammals in the North Pacific. Flicker, **17** (3): 51–54, Oct., 1945.

MOSSBERG, CURT. Valdemarsvikstraktens fåglar. Fauna och Flora, **5**: 224–231, 1945.

MOUSLEY, HENRY. The nesting of the Eastern Green Heron, *Butorides virescens virescens* (Linn.) in the province of Quebec, May, 1942. Canad. Field-Nat., **59** (2): 51–52, 1 pl., Mar.–Apr., 1945.

MUNRO, J. A. The birds of the Cariboo Parklands, British Columbia. Canad. Jour. Research, **23**, sec. D (3): 17–103, pls. 1–5, June, 1945.

MURPHY, ROBERT CUSHMAN. Ambassador to the penguins. Aud. Mag., **47** (5) sect. 1: 283–287, 6 figs., Sept.–Oct., 1945.

MURRAY, M. E. WOLFE. Some notes on the movement of birds in the Lovedale neighborhood—Nilgiris. Jour. Bombay Nat. Hist. Soc., **45** (1): 90–91, Dec., 1944.

NAGEL, WERNER O. Adaptability of the Chukar Partridge to Missouri conditions. Jour. Wildl. Manage., **9** (3): 207–216, fig. 1, July, 1945.

NEFF, EDWIN D. Meet Joe Gooney—clown of the island circuit. Nat. Hist., **54** (8): 373–374, Oct., 1945.

NEWSTEAD, ALFRED. Cormorants in the Dee at Chester. No. Western Nat., **19** (4): 294, Dec., 1944.

NICE, MARGARET M. Adventures at a feeding shelf. Chicago Nat., **8** (1): 8–12, Apr., 1945.

NICE, MARGARET M. New bird species recorded for Oklahoma since 1931. Proc. Okl. Acad. Sci., **24**: 14–16, 1944.

NICHOLL, A. M. C. Analysis of a casualty list. Field, **185** (4826): 621, 3 figs., June 23, 1945.

NICHOLL, A. M. C. Montagu Harriers at home. Field, **185** (4826): 618–619, 8 figs., June 23, 1945.

NORDICK, SISTER ESTELLE. Observations on bird life at the College of St. Benedict. Flicker, **17** (2): 29–31, May, 1945.

NUTE, GRACE LEE. A bird-loving taxidermist of the 1890's. [Ernest L.] Brown's diaries tell of Passenger Pigeons. Conserv. Volunteer, **8** (46): 29–34, 2 figs., May–June, 1945.

ODUM, EUGENE P. The concept of the biome as applied to the distribution of North American birds. Wils. Bull., **57** (3): 191–201, Sept., 1945.—Part I of symposium on bird distribution and ecological concepts.

ORCES V, GUSTAVO. Notas sobre la distribucion geografica de algunas aves Neotropicas (del Ecuador y noroeste del Perú). Flora, **4** (11, 12): 103–123, May, 1944.

OSGOOD, WILFRED H. Biographical memoir of Clinton Hart Merriam, 1855–1942. Nat. Acad. Sci., **24**: 1–57, 1 pl., 1945.

ÖSTERLOF, BO. Gladans (*Milvus milvus* L.) förekomst i Sverige. Vår Fågelvärld, **4** (3): 101–136, figs. 1–5, 1945.

OWEN, J. H. The nesting of the Long-tailed Tit. Brit. Birds, **38** (14): 271–273, July 2, 1945.

PARSONS, MRS. ROBERT. Cowbird eggs in Red-wing's nests. Iowa Bird Life, **15** (3): 49, Sept., 1945.

PEARSE, THEED. Mating of the Pacific Harlequin Duck. Canad. Field-Nat., **59** (2): 66, Mar.–Apr., 1945.

PEQUEGNAT, WILLIS E. A report upon the biota of the Santa Ana Mountains (cont.). Jour. Entomol. and Zool., **37** (2): 25–41, June, 1945.

PERRY, W. Movements of swifts. Victorian Nat., **62** (1): 7, May, 1945.

PEYTON, SIDNEY B. Field damage by Cedar Waxwings. Condor, **47** (4): 173, July–Aug., 1945.

PEYTON, SIDNEY B. Western Red-tailed Hawk catches Cooper's Hark. Condor, **47** (4): 167, July–Aug., 1945.

PEZARD, ANDRE. Étude quantitative comparée des cellules de Purkinje du cervelet des oiseaux et de quelques mammifères. Bull. Biol., **75** (1): 1–87, figs. 1–23, pls. 1–2, 1941.

P., F. J. Publications on Iowa ornithology during 1944. Iowa Bird Life, **15** (3): 49, Sept., 1945.

PHELPS, WILLIAM H., JR. Las aves de las Islas Los Testigos, Los Frailes y La Tortuga. Bol. Soc. Venezolana Ciencias Naturales, **60**: 257–283, 4 pls., 1 map, July–Sept., 1944.

PHILIPPI B., RODULFO A.; JOHNSON, ALFREDO W.; and GOODALL, JACK D. Expedición ornitológica al norte de Chile. Bol. Mus. Nac. Hist. Nat., **22**: 65–120 + 5, figs. 1–10, 1944.—An important account of ornithological observations and collections in the Department of Arica.

PHILLIPS, RICHARD STUART. Cape May Warblers capturing flying insects. Wils. Bull., **57** (2): 132, June, 1945.

PICKFORD, KENNETH D. Observations on quails in Gloucestershire and their calls. Brit. Birds, **38** (13): 257–259, June 1, 1945.

PIERSON, L. D. A pet Cedar Waxwing. Jack-Pine Warbler, **23** (2): 75–77, pl. 9, Apr., 1945

PODTIAGUIN, B. Aves en piel coleccionadas por Félix Posner en Monte Sociedad, Chaco Paraguayo. Rev. Soc. Cient. Paraguay, 6 (3): 79–96, May 14, 1944.

PODTIAGUIN, B. Catalogo sistematico de las aves del Paraguay. Suplemento al catalogo. Rev. Soc. Cient. Paraguay, 6 (3): 7–66, May 14, 1944.

PODTIAGUIN, B. La revision de nuestros conocimientos sobre los Cuculiformes del Paraguay (cont.). Rev. Soc. Cient. Paraguay, 6 (3): 71–78, pl. 1, May 14, 1944.

PODTIAGUIN, B. Lista sistematica de las aves Paraguayas, según Don Félix de Azara (cont.). Rev. Soc. Cient. Paraguay, 6 (3): 67–68, May 14, 1944.

PODTIAGUIN, B. Materiales al estudio de las aves de la boca del Río Apa. Rev. Soc. Cient. Paraguay, 6 (3): 97–114, May 14, 1944.

PODTIAGUIN, B. Miscelanea ornitologica Paraguaya. Rev. Soc. Cient. Paraguay, 6 (3): 114–119, May 14, 1944.

PODTIAGUIN, B. Suplemento al Catálogo de la bibliografía útil a la ornitología Paraguaya. Rev. Soc. Cient. Paraguay, 6 (3): 69–70, May 14, 1944.

POPE, LIEUT.-COLONEL. Nesting habits of coursers and plovers. Avic. Mag., (5) 10 (2): 31–33, Mar.–Apr., 1945.

PREBLE, EDWARD A. Some grouse. Nature Mag., 38 (5): [252–254], 9 figs., May, 1945.

PRESTWICH, ARTHUR A. Early importation of Birds of Paradise. Avic. Mag., (5) 10 (2): 44–47, Mar.–Apr., 1945.

PURDON, JOSEPHINE N. So much for so little. Bull. Mass. Aud. Soc., 29 (7) sect. 1: 197–203, 3 figs., Oct., 1945.

RACEY, KENNETH. Nesting of Western Bluebird. Canad. Field-Nat., 59 (1): 43, Jan.–Feb., 1945.

RAINES, R. J. Cirl Buntings in Nottinghamshire. Brit. Birds, 38 (14): 274, July 2, 1945.

RAINES, R. J. Red-necked Grebe in Nottinghamshire. Brit. Birds, 38 (14): 277, July 2, 1945.

RAINES, R. J. Shore-Lark in Nottinghamshire. Brit. Birds, 38 (15): 297, Aug. 1, 1945.

RAINES, R. J. Status of Wood-lark in Nottinghamshire. Brit. Birds, 38 (15): 297, Aug. 1, 1945.

RAINES, R. J., AND T. W. Unusual birds in Nottinghamshire during the cold spell. Brit. Birds, 38 (15): 295, Aug. 1, 1945.

RAND, A. L. Green-tailed Towhee in Saskatchewan. Canad. Field-Nat., 59 (1): 44, Jan.–Feb., 1945.

RAND, A. L. Hungarian Partridge in the Ottawa-Montreal area. Canad. Field-Nat., 59 (1): 26–27, Jan.–Feb., 1945.

RAND, A. L. Kentucky Warbler *Oporornis formosus* (Wilson), at Point Pelee, Ontario. Canad. Field-Nat., 59 (2): 70, Mar.–Apr., 1945.

RAND, A. L. Northern records of the Magpie, *Pica pica hudsonia* (Sabine). Canad. Field-Nat., 59 (1): 45, Jan.–Feb., 1945.

REDDICK, MARY LOGAN. The differentiation of embryonic chick medulla in chorio-allantoic grafts. Jour. Comp. Neurol., 82 (3): 283–297, pl. 1, June, 1945.

RIPLEY, S. DILLON. A new race of nightjar from Ceylon. Bull. Brit. Orn. Club, 457: 40–41, June 20, 1945.—*Caprimulgus macrurus aequabilis*, new subspecies.

RIX, C. E. A trip to the Coorong. So. Austral. Ornith., 17 (6): 56–72, June, 1945.

ROLLIN, NOBLE. Song-Thrush song. Brit. Birds, 38 (14): 262–270, figs. 1–5, July 2, 1945.

ROYAL SOCIETY FOR THE PROTECTION OF BIRDS. Fifty-fourth Annual Report: 1–40, 1945.

RUEGGER, SAM. Nesting ravens. Pass. Pigeon, **7** (3): 59–60, 5 figs., July, 1945.

RUSCHI, AUGUSTO. Novo caso de híbrido entre os troquilideos, *Thalurania glaucopis* × *Melanotrochilus fuscus*. Bol. Mus. Nacional [Rio de Janeiro], Zool., **24**: 1–4, figs. 1–2, Sept. 10, 1944.

RYVES, B. H. Fulmar breeding in Cornwall. Brit. Birds, **38** (15): 298, Aug. 1, 1945.

SANDGREN, GUNNAR, AND BROMIHN, JOHN. Häckning av grågås i Stenbrohult, Småland. Vår Fågelvärld, **4** (3): 142, 1945.

SCALON, W.-N. Quelques trouvailles ornitologiques interessantes dans la Sibérie orientale. Gerfaut, **31** (2): 67–73, 1941.

SCHORGER, A. W. Bird portraits by Peter Rindisbacher. Wils. Bull., **57** (2): 88–91, pl. 8, June, 1945.

SCHORGER, A. W. Henry Nehrling, the man who planned the present Milwaukee Museum. Pass. Pigeon, **7** (2): 34–39, 1 fig., Apr., 1945.

SCHORGER, A. W. Ned Hollister. Pass. Pigeon, **7** (3): 78–83, 1 fig., July, 1945.—A biographical sketch.

SCHORGER, A. W. The Golden Eagle in Wisconsin. Pass. Pigeon, **7** (2): 48–51, 1 fig., Apr., 1945.

SENSENIG, CARL E. The formation of pellets by the Barred Owl. Wils. Bull., **57** (2): 132, June, 1945.

SHADLE, ALBERT R. Dayton Stoner, naturalist. Univ. State N. Y. Bull. to Schools, **31** (7): 214–215, 1 fig., Mar., 1945.—An obituary.

SHAE, WILLIAM T. Wildlife zones across central California. Sci. Monthly, **60** (2): 97–107, figs. 1–12, Feb., 1945.

SHEPPARD, R. W. Gulls and terns hawking flying insects. Wils. Bull., **57** (3): 204, Sept., 1945.

SJÖGREN, SVEN JOHAN. Die Entwicklung der Embryonaldunen bei *Phaisanus colchicus torquatus* (Gmel.). Kungl. Fysiogr. Sällsk. Lund Förhandl., **15** (19): 1–9, figs. 1–3, Mar. 11, 1945.

SKEAD, C. J. Display of the S. A. Hoopoe. Ostrich, **16** (1): 77–78, Mar., 1945.

SKUTCH, ALEXANDER F. On the habits and nest of the Ant-thrush, *Formicarius analis*. Wils. Bull., **57** (2): 122–128, June, 1945.

SKUTCH, ALEXANDER F. The magnificent Quetzal. Nature Mag., **38** (6): 299–302, 330, 5 figs., June–July, 1945.

SKUTCH, ALEXANDER F. A village in a tree-top. Nature Mag., **38** (3): 125–128, 162, 4 figs., Mar., 1945.—Concerning Montezuma's Oropendola.

SOOTER, CLARENCE A. Soaring geese at Tulelake, California. Wils. Bull., **57** (3): 202, Sept., 1945.

SOUTHERN, H. N. The economic importance of the House Sparrow, *Passer domesticus* L.: a review. Ann. Applied Biol. (London), **32** (1): 57–67, Feb., 1945.

SPOFFORD, WALTER R. Competition for territory. Migrant, **16** (2): 30, June, 1945.

SPOFFORD, WALTER R. Falconry and conservation. Nature Mag., **38** (5): 258–261, 274–275, 6 figs., May, 1945.

SPRUNT, ALEXANDER, JR. "The Phantom of the Marshes." Florida Nat., **18** (4): 57–63, July, 1945.

SPRUNT, ALEXANDER, JR. The vanished legions. Aud. Mag., **47** (3) sect. 1: 130–133, 2 figs., May–June, 1945.—Whooping Cranes.

SQUIRES, W. AUSTIN. The James S. Lord collection of birds' eggs. Acad. Nat., **2** (5): 67–80, May, 1945.

STATON, J. The breeding of Black-winged Stilts in Nottinghamshire in 1945. Brit. Birds, **38** (17): 322–328, pls. 7–10, Oct. 1, 1945.—First breeding record for the British Isles.

Steffen, Earnest W. Birds at my studio window. Iowa Bird Life, **15** (2): 22–25, 4 figs., June, 1945.—Drawings by the author.

Stevens, C. J. Scarlet Grosbeak in Cornwall. Brit. Birds, **38** (15): 295–296, Aug. 1, 1945.

Stirrett, Geo. M. The Kentucky Warbler in Canada. Canad. Field-Nat., **59** (2): 70, Mar.–Apr., 1945.

Stirrett, Geo. M. The Short-eared Owl nesting in Kent County, Ontario. Canad. Field-Nat., **59** (1): 46, Jan.–Feb., 1945.

Stoner, Dayton, and Lillian C. How fast does a Catbird grow? Univ. State N. Y. Bull. to Schools, **31** (7): 217–219, 4 figs., Mar., 1945.

Storer, Robert W. The systematic position of the Murrelet, genus *Endomychura*. Condor, **47** (4): 154–160, figs. 27–29, July–Aug., 1945.

Sturkie, Paul D. The effects of low incubation temperatures on the expression of rose and duplex comb, crests, muffs, frizzled, naked neck and triple spurs in the domestic fowl. Amer. Naturalist, **79** (782): 286–288, May–June, 1945.

Sutton, George Miksch. At a bend in a Mexican River (cont.). Aud. Mag., **47** (3) sect. 1: 173–178, 5 figs., May–June, 1945.

Sutton, George Miksch. At a bend in a Mexican river (concl.). Aud. Mag., **47** (4) sect. 1: 239–242, 2 figs., July–Aug., 1945.

Swaine, Christopher M. Notes on the roosting of certain birds. Brit. Birds, **38** (17): 329–332, Oct. 1, 1945.

Swaine, Christopher M., and Lord, J. Breeding of Woodcock in central Flintshire. Brit. Birds, **38** (17): 336, Oct. 1, 1945.

Swift, Lloyd W. Our national forests as a home for wildlife. Aud. Mag., **47** (5) sect. 1: 288–295, 9 figs., Sept.–Oct., 1945.

Tavares de Macedo, Luiz Raymundo. Acão da fenotiazina sôbre protozoários enterícolas de "*Meleagris gallopavo domestica*" é "*Gal[l]us domesticus*." Bol. Inst. Vital Brazil, **27**: 47–57, 5 figs., Dec., 1944.

Taylor, J. Sneyd. Notes on the birds of the Van Ryneveld's Pass irrigation lake, Graaff-Reinet (August, 1943–July, 1944). Ostrich, **16** (1): 44–49, Mar., 1945.

Teale, Edwin Way. In the Florida shallows. Aud. Mag., **47** (5) sect. 1: 299–305, 6 figs., Sept.–Oct., 1945.

Temperley, George W. Ornithological report for Northumberland and Durham for 1944. Naturalist, **814**: 97–104, July–Sept., 1945.

Terrill, L. McI., Report on birds. Prov. Quebec Soc. Protect. Birds, annual report: 5–26, **1944**.

Thibaut de Masières, Claude. Observations sur le comportement du Gobemouches à collier. Gerfaut, **32** (2): 44–48, 1942.

Thibaut de Maisières, Claude. Les oiseaux du domaine forestier Pallavicini N. W. du Mont Bukk (Hongrie). Gerfaut, **30** (3): 130–136, 2 figs., 1940.

Thomson, Landsborough A. Report of the bird-ringing committee. Brit. Birds, **38** (15): 290–294, Aug. 1, 1945.

Thorn, Sam. Banding the Sparrow Hawk. Pass. Pigeon, **7** (2): 46–47, 1 fig., Apr., 1945.

Tucker, B. W. Hen-Harrier in Aberdeenshire in summer. Brit. Birds, **38** (14): 275, July 2, 1945.

Tucker, B. W. Report on quail in the British Isles in the summer of 1944. Brit. Birds, **38** (13): 250–252, June 1, 1945.

Tucker, B. W. Snow-Bunting in Oxfordshire. Brit. Birds, **38** (14): 274, July 2, 1945.

TUFTS, R. W. Eastern Phoebe in Nova Scotia. Canad. Field-Nat., **59** (2): 70, Mar.–Apr., 1945.

TWOMEY, ARTHUR C. The bird population of an elm-maple forest with special reference to aspection, territorialism, and coactions. Ecol. Monogrs., **15** (2): 173–205, figs. 1–12, Apr., 1945.

U. S. FISH AND WILDLIFE SERVICE. Status of migratory birds: 1944–45. Wildlife Leaflet **274** (mimeogr.): 1–10, July, 1945.

VAN BENEDEN, A. Un ancien peintre animalier, certainement ornithologue, ignoré. Gerfaut, **32** (2): 53–55, 1942.—Concerning Arnold Smitsen.

VAN BENEDEN, A. Le Coq-sur-mer en Juillet. Gerfaut, **32** (1): 17–22, 1942.

VAN BENEDEN, A. Quelques observations sur le Gobe-mouche noir. Gerfaut, **32** (2): 40–43, 1942.

VAN CLEAVE, HARLEY J. A new species of the Acanthocephalan genus *Polymorphus* from the American Coot. Jour. Parasitol., **31** (2): 128–130, 1 pl., Apr., 1945.

VAN ROSSEM, A. J. Cock roosts of the Texas Nighthawk. Condor, **47** (4): 170, July–Aug., 1945.

VAN TYNE, JOSSELYN, AND TRAUTMAN, MILTON B. Migration records from Yucatan. Wils. Bull., **57** (3): 203–204, Sept., 1945.

VAUGHN, CHARLES. Observations on the birds of Wake Island. Migrant, **16** (2): 26–28, June, 1945.

VERNON, E. T. Smew in Aberdeenshire. Brit. Birds, **38** (14): 276, July 2, 1945.

VERNON, R. L. Garganey and Whooper Swans in Caernarvonshire. Brit. Birds, **38** (17): 335–336, Oct. 1, 1945.

VINCENT, J. Remigrations of the Larger Stripe-breasted Swallows. Ostrich, **16** (1): 72–75, Mar., 1945.

VOROBIEV, K. A. Indo-Himalayan element in the Ornithofauna of Russian Turkestan. Compt. Rend. (Doklady) Acad. Sci. URSS, **45** (9): 401–404, 1944.

WAGNER, GEORGE. Madison and Palo Alto. Pass. Pigeon, **7** (3): 75–77, 94, July, 1945.

WAGNER, HELMUTH O. Notes on the life history of the Mexican Violet-ear. Wils. Bull., **57** (3): 165–186, figs. 1–10, Sept., 1945.

WARBURG, G. Garden-warbler in Middlesex in February. Brit. Birds, **38** (13): 255, June 1, 1945.

WALKER, LEWIS WAYNE. The Black Gooney. Nat. Hist., **54** (8): 370–372, 6 figs., Oct., 1945.

WALKER, LEWIS WAYNE. The White Gooney. Nat. Hist., **54** (8): 375–376, 5 figs., Oct., 1945.

WALKER, WM. M. Spring roosting of swifts. Migrant, **16** (2): 31–32, June, 1945.

WALLACE, GEORGE J. Michigan winter bird records. Jack-Pine Warbler, **23** (2): 66–74, Apr., 1945.

WALLACE, GEORGE J. Seasonal records of Michigan birds—spring. Jack-Pine Warbler, **23** (3): 106–122, July, 1945.

WARREN, D. C. A case of lateral asymmetry in the fowl. Jour. Hered., **36** (8): 227–231, figs. 1–2, Aug., 1945.

WARRINER, BENJ. R. Red-headed Woodpeckers increasing. Migrant, **16** (2): 32, June, 1945.

WARRINER, BENJ. R. Some observations on the Blue Grosbeak. Migrant, **16** (2): 24–26, 1 fig., June, 1945.

WATERS, NELSON F. The influence of inbreeding on sexual maturity. Poultry Sci., **24** (5): 291–395, figs. 1a–1b, Sept., 1945.

WATERS, NELSON F. Lymphomatosis in chickens as influenced by diallel crossing. Poultry Sci., **24** (5): 387–390, Sept., 1945.

WATERSTON, GEORGE. Black Tern in Aberdeenshire. Brit. Birds, **38** (15): 299, Aug. 1, 1945.

WEAKLEY, S. A. White Pelicans and Cliff Swallows on Tenn. River. Migrant, **16** (2): 33–34, June, 1945.

WETMORE, ALEXANDER. Record of the Turkey from the pleistocene of Indiana. Wils. Bull., **57** (3): 204, Sept., 1945.

WHISTLER, HUGH. Materials for the ornithology of Afghanistan. Part II (cont.). Jour. Bombay Nat. Hist. Soc., **45** (1): 61–72, Dec., 1944.

WHITE, C. N. M. On francolins from Angola and Northern Rhodesia. Bull. Brit. Orn. Club, **457**: 38–40, June 20, 1945.—*Pternistis afer manueli* (Cazombo, Angola) and *P. a. mackenziei* (Nguvu), new subspecies.

WIGGINS, IRA L. Observation of the South American Condor. Condor, **47** (4): 167–168, July–Aug., 1945.

WIGSTEN, HALDUR. Fågellivet på Fårön. Fauna och Flora, **5**: 217–223, 1945.

WILLIAMS, C. S., AND JENSEN, G. H. A versatile boat for waterfowl management and research. Jour. Wildl. Manage., 9 (3): 191–195, pls. 6–8, July, 1945.

WILSON, IDA DE MAY. Birds of the Kettleman Hills area, California. Condor, **47** (4): 149–153, July–Aug., 1945.

WILSON, NELLIE O. A sapsucker in destructive mood. Flicker, **17** (3): 65–66, Oct., 1945.

WILSON, NELLIE O. The Cardinal bird in Montevideo, Minnesota. Flicker, **17** (3): 66–67, Oct., 1945.

WINGSTRAND, KARL GEORG. Turturduva iakttagen i Lund. Vår Fågelvärld, **4** (3): 141, 1945.

WINGSTRAND, KARL GEORG. Zur Diskussion über das Brüten des Huhnerhabichts, *Accipiter gentilis* (L.). Kungl. Fysiogr. Sällsk. Lund Förhandl., **13** (23): 1–9, fig. 1, 1 fig., Nov. 27, 1943.

WOODBURY, ANGUS M., AND RUSSELL, HENRY NORRIS, JR. Birds of the Navajo country. Bull. Univ. Utah, **35** (14): 1–[160], figs. 1–8, 1 map (fold.), Mar. 1, 1945. —An annotated list of birds, based principally upon several recent expeditions (1933–1938) but expanded to include other available data. It is introduced by a discussion of the region (southeastern Utah and northeastern Arizona) and its ecological habitats. Specimens are recorded and other data given for most of the species.

WORTELAERS, FLORENT. Une saison de nidification avec un couple de Bondrées Apivores *Pernis apivorus* (L.). Gerfaut, **30** (1): 1–14, 1 pl., 1940.

YOUNG, JAMES B. An owl friend of mine. Aud. Mag., **47** (5) sect. 1: 306–308, 1 fig., Sept.–Oct., 1945.

ZIRRER, FRANCIS. The raven. Pass. Pigeon, **7** (3): 61–67, 1 fig., July, 1945.

ZIRRER, FRANCIS. The Ring-necked Duck. Pass. Pigeon, **7** (2): 41–46, 1 fig., Apr., 1945.

ZWILLING, EDGAR. Production of tail abnormalities in chick embryos by transecting the body during the latter part of the second day of incubation. Jour. Exper. Zool., **98** (3): 237–247, figs. 1–7, Apr., 1945.

ZWILLING, EDGAR. The embryogeny of a recessive rumpless condition of chickens. Jour. Exper. Zool., **99** (2): 79–91, figs. 1–5, July, 1945.

OBITUARY

WILBUR STUART LONG, a former Associate of the American Ornithologists' Union (1935–1940), died of a heart attack at Moab, Utah, October 19, 1944. He was born July 11, 1903, at McArthur, Ohio.

In 1935 he received the degree of M.A. at the University of Kansas and entered the United States National Park Service as Wildlife Technician at Zion National Park, Utah. In August, 1936, he transferred to the United States Soil Conservation Service as Junior Biologist and in January, 1939, was promoted to Assistant Biologist. At the time of his death he was District Conservationist for Grand and San Juan counties, Utah. While with the Soil Conservation Service he worked in Colorado and Utah.

He was also a member of the American Society of Mammalogists, the Wildlife Society, the Cooper Club, and the Wilson Ornithological Club, but his chief interest was ornithology. He was a born collector and fieldman, and collected birds in several western states and published several articles on ornithology.—A. E. BORELL, *Soil Conservation Service, U. S. Dept. Agriculture, Albuquerque, N. M.*

NOTES AND NEWS

Dr. Frank Michler Chapman, Fellow and Past-President of the A. O. U., died in New York City on November 15, last.

Word continues to come in concerning European ornithologists and ornithological collections.

From Belgium comes the information that Jean Derscheid was taken prisoner by the Germans on October 18, 1941, and after a long imprisonment, first in Belgium and then in Germany, was shot on March 13, 1944, and his body burned on the 18th. His ashes have been recovered.

The British Museum of Natural History received considerable injury from bombs by which the exhibition collections of birds and nests were extensively damaged or destroyed. In one of the explosions, David Bannerman and Claude H. B. Grant, who were in the bird room at the time, narrowly escaped injury. The study collection of birds is safe, having been taken elsewhere for safekeeping.

The Liverpool Museum was burned out, but the skin collection had been removed to Wales and presumably is intact.

One of the wings of the Royal Museum of Natural History at Leiden, Holland, was struck, but the main building escaped damage. Dr. G. C. A. Junge is still at work in this institution.

Various European journals are again reaching this country. Among them may be mentioned the Dansk Ornithologisk Forenings Tidsskrift, Revista Italiana di Ornitologia, Journal für Ornithologie, Ornithologische Monatsberichte, Der Vogelzug, Ardea, and numerous general zoological series.

L'Oiseau et Revue Française d'Ornithologie was published throughout the war and four volumes (1941–1944) are available. The volume for 1945 is in press. The five volumes can be ordered from Mr. Jean Delacour, New York Zoological Society, Bronx Park, New York 60, N. Y., at $18.00 for the full set which can be remitted to Mr. Delacour.

CORRESPONDENCE

TEMPERATURE TOLERANCE OF BIRDS' FEET

THE EDITOR OF THE AUK:

We love our mysteries. On the one hand, a scientist does his best to reduce mystery to commonplace fact, by research. On the other hand, the same scientist reads mystery stories. This is quite all right, as long as the two interests remain separated. Zoologists, including ornithologists, are warm-blooded animals. If they walk barefooted in subzero snow or dangle their bare feet in ice water, they soon suffer acute discomfort. Birds are also warm-blooded. Some birds walk barefooted in subzero snow and others dangle their feet in ice water. Since we would be uncomfortable, so must they be. We love our mysteries.

During the past many months, while making library and other studies of metabolism and animal-heat loss, I have repeatedly encountered scientists who interpret the animal's thermal adaptations and responses in terms of their own (that is, man's) adaptations and responses. For this and other reasons, the literature dealing with the thermal lives of animals is crowded with serious error. The mystery of the barefoot bird in wintertime points to some of the error.

In The Auk for July, 1945, under General Notes, Norris-Elye writes of Canada Jays that joined the hot-stove league. The jays would fly into a tent, land on a stove top, and stand there for from five to eight seconds. "The heat was sufficient to make a drop of water flash into steam." This is an interesting and valuable observation, and we need more like it. The trouble comes in the analysis and interpretation. Norris-Elye, speaking of this phenomenon, and of ". . . why the feet of birds do not freeze in subzero temperature," assumes a ". . . marvelous insulation against the transfer of heat possessed by these birds." He says: "The answer is obviously insulation against heat loss. . . ." This interpretation simply makes a bad matter worse. The mystery will be heightened rather than cleared up by looking for marvelous but nonexistent heat insulation in or on bare toes and tarsi.

A few statements of fact are in order.

1. If a bird succeeded in maintaining bare toes and tarsi at body temperature when getting about in subzero weather or when the feet are in ice water, the rate of heat loss would be so great that the bird could not eat enough energy in the form of food to make up for the loss and also maintain bodily functioning. This is not an opinion. It is a fact, based on computations the writer may some day publish elsewhere.

2. The bird is under no necessity for maintaining body temperature (or anything like it) in the feet. In fact, it is under the absolute necessity of permitting these parts to adopt nearly the temperature imposed by cold surroundings; otherwise, it would die from excessive heat loss.

3. Adaptation to cold exposure requires, and is in part accomplished by, a complete or nearly complete stoppage of blood circulation in the feet. This statement is supportable from all standpoints: (a) very little muscle or other tissue requiring a blood supply is to be found in these parts: (b) when these parts drop to low temperatures, metabolism in them almost ceases; (c) if much blood continued to flow, much heat would be lost.

4. Survival of the bird's tissues at low temperatures can be better appreciated by knowing what human tissue can stand. Human tissue, removed from the

body, can live for long periods at 4° C. (39.2° F.). In the 'whole' human being, limbs can go for long periods, with little or no circulation, at a refrigeration-anasthesia temperature down near 0° C. (32° F.). The longest record of this sort, recently reported, was that of a limb so maintained for 79 days. The limb was saved. If we wish, we might think of the bird foot in winter as being in a state of refrigeration anasthesia, but still operable as a tool—with its tendons pulled on by muscles sufficiently warm in their location closer to the body.

5. Bats survive a *body* temperature of —1.7° C. (29° F.) without injury (G. M. Allen, 'Bats': 274, Harvard Univ. Press, 1939).

6. With the blood supply withdrawn, little water is present in the bird foot and tarsus. No damage can be done until actual freezing occurs. The tissue freezing point would be several degrees below 0° C. (32° F.), and it might, in some species, be many degrees below.

So much for low temperature toleration. Returning to the Canada Jays, how can they stand on a stove top for several seconds? First, they did. Second, there need be no mystery about it.

Assume that the bird flies in, with feet at 0° C. (32° F.), and lands on a stove surface having a temperature of 120° C. (248° F.). There would be contact or near-contact, by nail tips and by callosities on the toes. Assume a callus is one millimeter thick. Adopt reasonable values of thermal properties for the callus material. Compute (by methods not included here) the temperature to which the living tissues would come, by virtue of heat conducted through the callus to interior toe tissue. The writer's figures show that, within the five to eight seconds cited, such tissue would just about reach the danger temperature of perhaps 44° C. (111° F.) in this time and for these circumstances.

Other parts of toes and tarsi not in contact with the stove would be heated by radiation and natural convection. Computation readily shows that these parts would take a still longer time for the living tissues to reach a lethal temperature. Thus, the time limit appears to be set by contact parts, rather than noncontact parts.

It should be understood that there is no magic by which these heat problems can be solved accurately. Some of the basic data needed have to be assumed, and the answers have a margin of error. However, the computations do show whether the phenomenon is reasonably possible.

Close observation might show that when the jay's foot is cold and stiff, it does not fully open. If only the nail tips touch the stove top, the surface could be well above 120° C., without injuring living tissue in five to eight seconds.

Some proper lines of investigation are easily indicated. How cold can a bird's foot become before tissue freezing occurs? Can the bird operate the foot, at least awkwardly, at any temperature short of tissue-freezing temperature? Is the foot richly or poorly equipped with heat-sense and cold-sense nerve endings? Is the heat-sense inoperative when the foot is very cold? If so, harmful scorching could ensue when a stand on a very hot stove is made. Is there a cold-sense mechanism present that does not result in feelings of discomfort, but does warn the bird that the feet are about to freeze; or is it simply that stiffness causes the bird to cease activity, whereupon the feet are drawn up and warmed enough to be saved? How does leg and foot circulation vary with the temperature of the parts (a job best done, perhaps, with tagged atoms)?

As far as I know, not even a start has been made to look into any of these questions.—A. D. Moore, *University of Michigan.*

THE SIXTY-THIRD STATED MEETING OF THE AMERICAN ORNITHOLOGISTS' UNION

BY LAWRENCE E. HICKS

THE twelfth meeting to be held in the Boston-Cambridge area took place October 24–25, 1945. Headquarters were at the Hotel Statler in Boston with the business sessions on the campus of Harvard University in Cambridge. For the third consecutive year it was not possible to hold a regular program meeting involving presentation of papers, annual dinner, social gatherings and field trips. A complete program meeting will be held in 1946, for the first time since 1942, at a time and place to be decided upon at a later date by the Council.

BUSINESS SESSIONS

The meeting on Wednesday, October 24, included two sessions of the Council, a meeting of the Fellows at 3:30 P. M. and a meeting of the Fellows and Members at 4:00 P. M. Fifteen members of the Council, 18 Fellows and 30 Fellows and Members, respectively, were present at these three meetings. Twelve members of the Council met again Thursday morning to complete business on the agenda.

One Fellow, one Honorary Fellow, eight Members and 234 Associates were elected. On September 30, 1945, the paid A. O. U. membership (as checked against the Treasurer's report) was as follows: Patrons, 3; Emeritus Fellows, 2; Honorary Fellows, 14; Corresponding Fellows, 74; Fellows, 49; Members, 133; Associates, 1,368; paid Associate-elects, 192. Total, 1,835. This is a net increase of 101 members over the same date in 1944, resulting for the second consecutive year in a new all-time high in membership numbers. In addition there were 235 subscribers, a net increase of 27 over the year 1944. Including 41 exchanges, the number of copies of 'The Auk' mailed each issue has now passed the 2,000 mark for the first time.

The report of Treasurer Frederick C. Lincoln indicates receipts during the year of $9,609.64, not including $1,522.11 in the Canadian account in the Bank of Montreal. Of $7,764.48 in disbursements, $5,638.03 went for manufacture of 'The Auk.' The cash on hand at the close of the year amounted to $1,454.29, or $919.50 more than on the same date in 1944.

There have been 13 resignations (of Associates) and 20 deaths of members during the year: 1 Honorary Fellow, 2 Corresponding Fellows, 2 Fellows and 15 Associates. On December 1, 1945, the known

vacancies were as follows: Honorary Fellows, 6; Corresponding Fellows, 2; Fellows, 1; Members, 9; Associates, unlimited.

The Secretary reported that the accumulated surplus in the Endowment Educational Fund had made it possible to grant 21 A. O. U. scholarship memberships to worthy students in 1943, 24 in 1944, and 14 in 1945. In 1946 and thereafter it will be possible to grant only 8 unless the Union receives special gifts or endowment grants for this purpose. In the postwar years there will be unusually large numbers of needy college students that could benefit greatly from association with the Union. The Union in turn would benefit through increased revenue and circulation of 'The Auk,' as well as by acquiring each year a highly selected group of potentially valuable members. The need is great as the committee could distribute at least 50 to 100 of these student memberships to advantage each year. A contribution of only three dollars will make one of these memberships possible. Send in yours to one of the officers now.

Some of the postwar planning in regard to membership increase, discussed at the 1944 meeting, has been put into operation during the year. The President appointed a committee of 49 representing 47 states to canvass the field for names suitable for nomination. Eighteen members of this committee got their work well started in 1945 by obtaining 91 new members. The committee was responsible for 39% of the 234 new Associates elected at the Cambridge meeting. Dr. Ernst Mayr has recently been appointed Chairman of this important committee to direct and correlate its activities. The Committee will be expanded and revised to give at least one active committeeman in each state and province. Those interested in serving are urged to contact the Chairman. Our goal is 2,000 paid-up members by the date of the 1946 meeting.

The report of the Investing Trustees shows that the A. O. U. Endowment funds, as of September 30, 1945, totalled $33,119.92. The income for the year ending on that date was $1,847.92, representing average earnings of more than 5%—a fine record.

The report of the Special Canadian Committee, given by Hoyes Lloyd, Chairman, indicates that dues have been received from 7 Fellows, 6 Members, 68 Associates and 2 subscribers, in addition to a gift of $1,000.00. The fund on September 29, 1945, included $1,535.61 in cash and a $500.00 Dominion of Canada Bond. The Council authorized the purchase of a $1,000.00 bond of the current Canadian Victory Loan.

A proposed new amendment to the by-laws was passed by the

Fellows and laid on the table for final action in 1946. This is an addition to Section I, Article III, and reads as follows: "As occasion demands, matters for decision may be submitted by the Secretary at the direction of the President to the Council for vote by mail. All such votes of the Council made by mail ballot shall be placed on the record and submitted for ratification at the next meeting of the Council.

The 1945 award of the Brewster Medal was made to H. Albert Hochbaum for his book, "The Canvasback on a Prairie Marsh," published by the American Wildlife Institute.

The Council voted to accept gifts of William P. Wharton, Edward A. McIlhenny and Hoyes Lloyd. These men having qualified as Patrons, the Secretary was instructed to enroll their names on the list of Patrons. The Council also instructed the Committee on Taxonomy and Nomenclature of North American Birds to proceed at once with preparation of a manuscript for the 5th Edition of the Check-List, and, since this will take considerably more than a year, to submit a 21st supplement for publication in 'The Auk' in 1946.

By special resolution, the Union expressed its appreciation of the kind hospitality of the Museum of Comparative Zoölogy and Harvard University, and of the arrangements made by the Local Committee (James L. Peters and Ludlow Griscom). A special vote of thanks was extended to Mr. Charles F. Batchelder (one of the two living Founders of the Union) and to Mrs. Batchelder, who entertained the Council at their home at luncheon on Wednesday noon, and to Professor Thomas Barbour who entertained the Fellows and Members at a dinner at the Harvard Club the same evening.

ATTENDANCE

The 1945 meeting, the twelfth to be held in the Boston-Cambridge area, had an attendance of 31: 17 Fellows, 1 Honorary Fellow, 12 Members, and 1 Associate (representing the Wilson Ornithological Club). Members were present from eight states and provinces: Massachusetts, 11; New Jersey, 1; New York, 7; Washington, D. C., 5; Ohio, 2; Michigan, 2; Ontario, 1; Virginia, 1; Vermont, 1.

MASSACHUSETTS, 11—*Fellows,* Thomas Barbour, Charles F. Batchelder, Ludlow Griscom, James L. Peters, Cambridge; A. C. Bent, Taunton. *Members,* Winsor M. Tyler, Brighton; Hubert L. Clark, James Greenway, Cambridge; Joseph A. Hagar, Marshfield Hills; Francis H. Allen, West Roxbury. *Associate,* Earle A. Brooks, Newton Highlands.

MICHIGAN, 2—*Fellow,* J. Van Tyne, Ann Arbor. *Member,* Joseph J. Hickey.

NEW JERSEY, 1—*Member,* B. S. Bowdish, Demarest.

NEW YORK, 7—*Fellows,* Arthur A. Allen, Ithaca; James P. Chapin, Ernst Mayr, Robert C. Murphy, John T. Zimmer, New York City. *Honorary Fellow,* Jean Delacour, New York City. *Member,* Oliver L. Austin, Sr., Tuckahoe.

OHIO, 2—*Fellows,* Harry C. Oberholser, Cleveland; Lawrence E. Hicks, Columbus.

ONTARIO, 1—*Fellow,* Hoyes Lloyd, Ottawa.

VIRGINIA, 1—*Member,* Roger T. Peterson.

VERMONT, 1—*Member,* Wendell P. Smith, Wells River.

WASHINGTON, D. C., 5—*Fellows,* Herbert Friedmann, Frederick C. Lincoln, Alexander Wetmore. *Members,* John W. Aldrich, S. Dillon Ripley.

ELECTION OF OFFICERS

The election of officers for 1945 resulted as follows: *President,* Hoyes Lloyd; *Vice-Presidents,* Robert C. Murphy and J. Van Tyne; *Secretary,* Lawrence E. Hicks; *Treasurer,* Frederick C. Lincoln; *Members of the Council* (in addition to officers and ex-presidents) for three years, Joseph J. Hickey, George M. Sutton, Clarence Cottam. For two years, John W. Aldrich.

The Council re-elected John T. Zimmer, editor of 'The Auk'; Frederick C. Lincoln, Business Manager; Julian K. Potter, James Savage and Rodolphe M. deSchauensee, Trustees, and the President, the Secretary, the Treasurer, Rodolphe M. deSchauensee and Ludlow Griscom, Members of the Finance Committee.

ELECTION OF FELLOWS, MEMBERS AND ASSOCIATES

HONORARY FELLOW, 1—Dr. Oliverio Mario de Oliveira Pinto, São Paulo, Brazil.

FELLOW, 1—Jean Linsdale, Monterey, California.

MEMBERS, 8—Marguerite Heydweiller Baumgartner, Stillwater, Oklahoma; Allan D. Cruickshank, New York City; H. Albert Hochbaum, Delta, Manitoba; Francis H. Kortright, Toronto, Ontario; G. C. Munro, Honolulu, Hawaii; George J. Wallace, East Lansing, Michigan; Leonard W. Wing, Pullman, Washington; Albert Wolfson, Evanston, Illinois.

ASSOCIATES, 234—Of these, 192 had paid their dues before the date of the meeting. The names of all that eventually qualify will be included in the 1946 complete address list of members to appear in the October issue.

THE 1945 MEMBERSHIP CAMPAIGN

The 1945 membership campaign resulted in the election of 234 new Associates at the Cambridge meeting. This brought the total paid-up A. O. U. membership to 1835, a net increase of 101 over 1944 and for the second successive year a new all-time high in membership numbers. By Council action, the Union now publishes each year the names of those responsible for obtaining new members, with the number obtained by each. The list includes 97 names of those contributing to the campaign in 1945. Members of any class are eligible to nominate Associate members. Eighteen of the following

are members of the Membership Committee (see list in 'The Auk' for October, 1945, p. 664).

28 new members—Leonard W. Wing.
19 new members—B. S. Bowdish.
17 new members—Lawrence E. Hicks.
9 new members—A. W. Schorger.
8 new members—Alden H. Miller.
6 each—Harry C. Oberholser, Julian K. Potter, Frederick C. Lincoln.
4 each—John W. Aldrich, A. O. Gross, Hoyes Lloyd, John T. Zimmer.
3 each—James L. Baillie, Jr., Dr. Morton E. Cummings, J. Southgate Hoyt, Dr. R. Allyn Moser, Perna M. Stine.
2 each—Bernard P. Brennan, E. M. Brigham, Jr., W. W. Bowen, Mrs. Francis Crowinshield, Paul L. Errington, J. Will Harmon, Mrs. A. R. Laskey, H. D. Lovell, Ernst Mayr, Hustace H. Poor, Jesse M. Shaver, Dorothy E. Snyder, L. L. Snyder, Wendell Taber, Lawrence Walkinshaw, George Willett.
1 each—A. A. Allen, Myrtle W. Baer, Mrs. Marie V. Beals, Dr. Alexander Blain, Benjamin J. Blincoe, Oscar M. Bryens, Irving W. Burr, Joseph M. Cadbury, E. B. Chamberlain, B. W. Cartwright, Ernest A. Choate, Fanny D. Clark, Marion Clow, Mrs. Minnie A. Common, Ethel M. Crowell, John Davis, H. Deignan, Williard E. Dilley, Victor K. Dodge, Paul E. Downing, Eugene Eisenmann, Arnold B. Erickson, Herbert Friedmann, Norman H. Giles, Jr., John H. Gray, Jr., J. A. Hagar, Harry W. Hann, Frank A. Hegman, Oliver H. Hewitt, J. J. Hickey, Herbert O. Hill, Stanley G. Jewett, John C. Jones, J. Warren Large, Aldo Leopold, Harrison L. Lewis, Gordon Meade, Harold Michener, Merriam L. Miles, Harold D. Mitchell, J. J. Murray, T. S. Palmer, A. M. Pearson, Walden Pell, II, Mrs. Raymond W. Perkins, Gayle Pickwell, Davis W. Pratt, T. S. Roberts, C. H. Rogers, A. A. Saunders, Archie D. Schaftesbury, Dr. A. R. Shearer, Mabel Slack, Paul Springer, J. W. Stack, H. Goodwin Stevenson, Henry M. Stevenson, W. E. Clyde Todd, M. B. Trautman, J. Van Tyne, E. M. Verges, II, Francis M. Weston, Alexander Wetmore, T. Ferdinand Wilcox.

DECEASED MEMBERS

During the year the Union lost 20 members by death: 1 Honorary Fellow, 2 Corresponding Fellows, 2 Fellows, and 15 Associates.

OSCAR HEINROTH, Honorary Fellow, (1932) 1939, died at Berlin, Germany, 1945.

DR. OTTO HELMS, Corresponding Fellow, 1920, died in Denmark, April 16, 1942.

FREDERICK NUTTEN CHASEN, Corresponding Fellow, 1934, died in the Strait of Malacca.

DR. FRANK MICHLER CHAPMAN, Fellow, (1885) 1888, aged 81, died in New York City, Nov. 15, 1945.

GEORGE WILLETT, Fellow, (1912) 1939, aged 66, died at Los Angeles, California, Aug. 2, 1945.

MRS. AMELIA SANBORN ALLEN (MRS. JAMES TURNEY ALLEN), Associate, 1919, died at Berkeley, California, Feb. 18, 1945.

RUSSEL MESSER BERTHEL, Associate, 1938, died at St. Paul, Minnesota, 1945 (?).

MISS LILLIE ROSE ERNST, Associate, 1933, died at St. Louis, Missouri, Dec., 1943.

FREDERICK HALL FOWLER, Honorary Life Associate, 1892, aged 66, died at Palo Alto, California, Nov. 7, 1945.

HARRY HOWARD KENNEDY, Life Associate, 1920, died at Berkeley, California, 1945 (?).

FRANK COATES KIRKWOOD, Honorary Life Associate, 1892, died at Baldwin, Maryland, July 24, 1945.

HERBERT NEWBY MCCOY, Associate, 1930, aged 75, died at Los Angeles, Calif., 1945 (?).

ERIC GRAHAM MCDOUGALL, Associate, 1933, died at Toronto, Ontario, about Feb. 14, 1945.

DR. CHARLES ANDREW MCNEIL, Associate, 1937, aged 70, died at Sedalia, Mo., 1945 (?).

JOSEPH T. MARSHALL, Associate, 1941, died in military service overseas, 1945 (?).

WILLIAM G. MOORE, Associate, 1937, died at Haddonfield, New Jersey, May, 1945.

EDWARD LUDLOW PARKER, Life Associate, died at Concord, Massachusetts, 1945 (?).

MISS HARRIET ELIZA RICHARDS, Honorary Life Associate, died at Brookline, Massachusetts, July (?), 1945.

FRANKLIN DELANO ROOSEVELT, Honorary Life Associate, 1896, age 63, died at Warm Springs, Georgia, April 12, 1945.

DR. EDWARD WIGGLESWORTH, Life Associate, 1920, aged 60, died at Boston, Massachusetts, 1945 (?).

OFFICERS AND COMMITTEES OF THE AMERICAN ORNITHOLOGISTS' UNION, 1946

	Expiration of Term
Lloyd, Hoyes, *President*	1946
Murphy, Robert C., *First Vice-President*	1946
Van Tyne, Josselyn, *Second Vice-President*	1946
Hicks, Lawrence E., *Secretary*	1946
Lincoln, Frederick C., *Treasurer* and *Business Manager*	1946
Zimmer, John T., *Editor of 'The Auk'*	1946

Additional Members of the Council

Miller, Alden H.	1946
Griscom, Ludlow	1946
Oberholser, H. C.	1946
Mayr, Ernst	1947
Rand, A. L.	1947
Aldrich, John W.	1947
Cottam, Clarence	1948
Hickey, Joseph J.	1948
Sutton, George M.	1948
van Rossem, Adriaan J., Cooper Ornithological Club Representative	1946
Brooks, Earle A., Wilson Ornithological Club Representative	1946

Batchelder, Charles F., 1905–08
Bent, Arthur C., 1935–37
Chapin, James P., 1940–42
Fisher, Albert K., 1914–17
Friedmann, Herbert, 1938–39
Peters, James L., 1943–45
Wetmore, Alexander, 1926–29
} *Ex-Presidents*

Committees

Membership Committee (for nomination of Associates)

Mayr, Ernst, *Chairman*

(For members of this committee from each state and province see 'The Auk' for Oct., 1945, p. 664, and later issues for revisions of this list.)

Committee for Nomination of Fellows and Members

Chapin, James P., *Chairman*

Van Tyne, Josselyn — Gabrielson, Ira N.

Special Canadian Committee

Lloyd, Hoyes, *Chairman*

Snyder, L. L. — Munro, James A.

Committee on the Brewster Memorial Award

Murphy, Robert C., *Chairman*

Zimmer, John T. — Allen, A. A.

Committee on Bird Protection

LINSDALE, J. M., *Chairman*

ERRINGTON, P. L. MUNRO, J. A.

Committee on Classification and Nomenclature of North American Birds

WETMORE, ALEXANDER, *Chairman*

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LINCOLN, FREDERICK C.
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PETERS, JAMES L.
VAN ROSSEM, A. J.
VAN TYNE, JOSSELYN
ZIMMER, JOHN T.

Committee on Biography and Bibliography

PALMER, T. S., *Chairman*

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THE AUK

A Quarterly Journal of Ornithology

ORGAN OF THE AMERICAN ORNITHOLOGISTS' UNION

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FREDERICK C. LINCOLN
Fish and Wildlife Service
Department of the Interior
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